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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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FRIDAY, JANUARY 31, 1908.

The short term notes issued so freely during the past two years are beginning to mature. But fortunately it is now possible to secure new railroad capital. The Delaware & Hudson, which has \$6,000,000 one-year notes of the Quebec, Montreal & Southern falling due in February has borrowed \$6,000,000 from the First National Bank and Kuhn, Loeb & Company, of New York, for six months at 4½ per cent. This company evidently believes that by August conditions will be favorable for permanent financing. The rate of 4½ per cent. on this loan is strong evidence of financial clearing. The Missouri Pacific has adopted a new expedient in order to get funds. Certain of its lines, including the connecting line running west to meet the Denver & Rio Grande at Pueblo, Col., which will on completion by 1909 of the Western Pacific, be part of the through line to the Coast, are the property of the Kansas & Colorado Pacific. A new "first refunding" mortgage has been created covering the lines of this company which, including refunding, is limited to \$30,000 per mile on 1,450 miles, a total of \$43,500,000. The prior liens are at the rate of \$15,544 per mile. These bonds are 30-year 6 per cents., dated February 1, 1908, guaranteed by the Missouri Pacific. Of these bonds, \$12,000,000 have been deposited as collateral for \$6,000,000 Missouri Pacific two-year 6 per cent. notes dated February 10, 1908, convertible at par into the first refunding mortgage 6 per cent. bonds of the Kansas & Colorado Pacific by which they are secured. These notes are to refund a like amount of 5 per cent. notes originally issued in 1904 as two-year notes, in 1906 extended for two years and maturing February 10, 1908, and they have been sold to bankers and offered to the public at 99. We are informed by the bankers that these are the first notes convertible into bonds ever issued. At the moment the railroad company could not sell the bonds themselves; it evidently hopes that the notes will all be converted within the next two years into the bonds and thus changed from a short term to a long term issue. Being secured by bonds, they are believed to be a legal investment for insurance companies in New York State.

TO GET TRACK-GANG EFFICIENCY.

There is in use in the track and bridge departments of the Illinois Central, and probably on other roads, a Time Roll and Distribution of Labor book which each foreman is compelled to keep marked up to date and turn over to his supervisor on the 27th of each month. Its effect is to make it easier to detect and

generally prevent any attempt to pad the payroll, or date back a new laborer or credit any laborer more time than he has made. Indirectly also it has a telling effect in preventing the men from paying the foreman a commission for their employment. The book is 8½ in. wide by 9 in. high, but it folds to 4½ in. by 9 in., and is inserted in an oilcloth cover and carried in the foreman's pocket with little danger of getting soaked and illegible.

Its peculiar feature is that each leaf consists of two pieces of white paper pasted together at the edges, and fastened immovable between those leaves is a carbon paper, so that when a pencil record is once made it cannot be erased because it is duplicated on the other sheet of this compound leaf. When a foreman makes a mistake in entering he cannot rub it out, but on another page provided for the purpose he can write an explanation of his mistake. Opposite each man's name there are two blank squares about a quarter of an inch wide for each day. Opposite each laborer's name the foreman puts a dot in the blank square showing when the man reports for work. At noon he puts the number of hours, 3 or 4 or 5; after dinner when each man begins, he puts a dot in the afternoon square, and in the evening puts in the number of hours, so that when a man works all day there are two dots and two figures entered. At night the foreman turns to another page of the book and enters up the totals for each man and the distribution of hours to the accounts chargeable.

To prevent the foreman dating a man back, and so giving him some extra days' pay in return for a commission or fee, the foreman is required to keep all blank spaces of a previous date cancelled by drawing lines across the spaces. The supervisor looks at the foreman's book frequently, and he must see to it that these cancellations of previous dates are kept up. More than this, the company employs a number of time checkers who have no other duties than the checking of the number of men employed in the gangs with the number of men shown on the time rolls. These checkers are shifted from time to time to various points and they appear on the work and check the time rolls of the foremen at any time. This might be called surprise checking.

The subsequent history of the books is interesting. On the 27th of each month the books are handed to the supervisor who holds them for a day or two for checking and correction and the making up of his own report. The foreman's book of original entry then goes with the supervisor's report to the auditor, who compares the payrolls with the work shown in the books, signs each book and

returns it to the supervisor. H. R. Safford, Chief Engineer of Maintenance of Way of the Illinois Central, tells us that in the beginning the foremen had to be educated in the use of these time rolls, and although some little trouble was experienced when the book was adopted, it was overcome in a short time and they are now having no trouble in getting the foremen to post up the time as described, four times a day, and to keep their books in a neat condition.

The use of the book has effected a reform and in this connection the following comments and reminiscences of an experienced supervisor are interesting: "The dishonesty among track employees is nearly always due to weakness—to a foreman's desire to put off the day of trouble—to be comfortable, after finding that it costs something to be known as a good fellow, 'appertaining to which,' as Bill Devery once said, 'A man might as well get ready to get it in the neck with an axe as soon as trying.'

"One of my foremen spent his evenings in the saloon to meet his friends and smoke a pipe. He did not drink in excess and went home early. He paid cash for his beer and tobacco at first, but once when he happened to be short, his friend, the proprietor, said, 'never mind.' This habit grew and it grew a good deal until the proprietor casually mentioned that he knew a good man who wanted a job. After that Mike paid for no more beer and the proprietor furnished all the men, charging the men for their jobs and keeping them as customers. I soon detected this in the amount of work done and had to let the foreman go. He was a good fellow and a good trackman.

"I had another foreman who was all for the interests of the company. He got good men and he held them. In a broadminded way he offered premiums for efficiency. If a valuable man was sick for a day or two he credited him full time if necessary; to coax a good man from somewhere else he dated him back a few days on the payroll. He had the best gang I ever saw. But the small irregularities leaked out and the foreman was blackmailed. He is still working, but he was transferred and is living down the past.

"Another valuable foreman was positively afraid to take a pen or pencil in his hand. He was always on his job, loyal and energetic; the first man out at the least sign of a storm. Work exhilarated him, but in making up his time book he would gasp for breath and at just the right time a handy man appeared who offered to keep his book and employ men for him. Of course, this handy man collected from the laborers and credited long hours and extra days and pretty soon I called in the foreman and showed him the results. The results were a reduction of 40 per cent. in efficiency."

TWO CENTS A MILE ON THE NEW HAVEN.

In the annual report of the New York, New Haven & Hartford Railroad Company for the year ending September 30, 1886, President George H. Watrous announced an important reduction of passenger fares by vote of the directors. Beginning with January 1, 1887, he said, the company would reduce to two cents a mile the regular fare on the main line from New York to Springfield, Mass., and at the same time would reduce to 2½ cents a mile the fare on the Shore Line and Air Line divisions of about 50 miles each. The actual reductions in each case appear to have been about half a cent a mile. The reduction was, in the main, voluntary. It was true that to some extent the menace of a "parallel" hung over the New Haven line that later materialized in a bitter and very corrupt battle in the Connecticut legislature when in the metaphor of the time "the ship of state floated in a sea of champagne shored by greenbacks." But at least there was no popular outcry for the reduction and no threat or danger that it would be enforced by legislation. It was a matter of broad rather than specific policy and in that policy the New Haven ranks as a pioneer among American railroads. The charter rate of two cents a mile on the main line of the New York Central, it is true, antedates the New Haven's action, but it was the legislative price paid for the consolidation of its lines across New York State.

In his report announcing the reduction, President Watrous forecast, on the basis of existing passenger traffic, a loss for the next fiscal year ending September 30, 1887, of \$500,000. The gap between prophecy and the event was striking. The year in question included nine months of the reduction. But instead of a half million decrease passenger receipts rose from \$4,225,698 to \$4,319,252, or a gain of \$93,554. Passengers carried rose from 8,267,310 to 9,361,426, a gain of 1,094,116, or somewhat more than 13 per cent., and passenger mileage rose from 226,162,000 to 249,161,000, a gain

of about 10 per cent. Comparison at that period cannot be pushed further as the New Haven in the fiscal year 1888 had included in its returns important additional lines under lease.

For some twenty years and until March 1, 1906, no important change was made in the New Haven's regular passenger rate. But in the meantime mileage books at the two cents a mile rate for 1,000 miles covering the whole system and "state" books at the same rate for 500 miles in the three states of Massachusetts, Rhode Island and Connecticut had entered very extensively into use. Early in the year 1906, President Mellen announced that the reduction to two cents a mile for regular fares would be made general on the whole system of 2,060 miles, including all divisions and branches. The change was to be progressive beginning March 1, 1906, and to be complete on November 1, 1906, the same year, and, oddly enough, it was to begin on certain subsidiary lines of the western part of the system and work eastward until in November it reached the through New York-Boston rate, thus, to a degree, reversing the order of density of passenger traffic. It may be remarked that this reduction was voluntary; that it forced a little later a reduction in less degree on the Boston & Maine also, and that gratitude for it on the part of Boston and Massachusetts has hardly been vivid. On the basis of existing passenger travel the reduced annual receipts were estimated by the company at \$703,000. What actually came to pass is set forth in the table annexed showing regular passenger and commutation earnings by months for three years beginning with the month (November) of the completed reduction:

	1904-1905.	1905-1906.	1906-1907.
November	\$1,644,604.17	\$1,720,178.60	\$1,769,874.26
December	1,502,737.23	1,650,828.28	1,746,998.26
January	1,376,963.65	1,530,594.92	1,594,016.71
February	1,261,977.62	1,378,539.60	1,428,238.00
March	1,464,601.85	1,513,632.30	1,678,095.98
April	1,625,820.82	1,697,672.10	1,782,568.04
May	1,690,828.66	1,750,870.10	1,896,496.17
June	1,753,286.60	1,922,768.26	1,971,738.24
July	1,962,653.30	2,042,011.49	2,166,634.15
August	2,035,472.99	2,175,649.18	2,424,158.44
September	2,075,676.91	2,181,416.26	2,263,966.59
October	1,890,040.54	1,996,331.92	2,049,092.22
Total	\$20,284,664.34	\$21,560,493.01	\$22,771,877.06

The first column represents the complete year beginning with November before the reduction; the second column includes eight months under the sliding scale of reduction, and the final column represents the first full year after the reduction went into force on the whole system. The impressive comparison is therefore between the first column and the last. It shows a gain in passenger receipts of \$2,487,212.72, or somewhat more than 12 per cent., and with no increase of track mileage worth mention, a fact which gives the comparative returns increased value. The great increment is emphasized also by the fact that it appears on a system where the mileage books were already very commonly used and, indeed, privately traded in by temporary transfers. On the other hand, it is to be noted that in the year 1905-1906 the company considerably developed its excursion business which, however, in the following year, was reduced by its inability to run its excursion trains to New York City owing to obstruction due to the terminal improvements above the Grand Central Station.

How much of this greatly increased passenger business was due to the two cent rate, how much to national growth of passenger traffic, cannot even be guessed at, and obviously there will be no light upon the subject during the year to come with its industrial recession affecting passenger traffic as well as freight. It is manifest also that the New Haven system, with its volume of passenger business not only immense, but dense and producing operating revenue almost equal to that from freight, holds a unique position in the matter of passenger rate reduction. Still, with every allowance on the plus and minus side, the increased revenue from reduced and uniform fares is peculiarly impressive. One cannot reason from the New Haven to other railroad systems great or small with their passenger business, nor to whole states or other geographical divisions that contain varied railroad lines. But the New Haven example has at least two sharp suggestions: First, the occasional value of voluntary as contrasted with compulsory passenger rate reductions; and, secondly, the feasibility and success of the "postage stamp" idea as applied progressively in systems with high passenger density, at first in the form of the mileage book, next to the zone of densest travel and finally to the system as a whole. Along these lines, without the dictate of legislatures or commissions, the future of the American railroad promises some instructive results. Were it not for the fear of public clamor for further and unreasonable reduction the idea would probably be tried out sooner and more often.

GOVERNMENT ACTION AGAINST THE HARRIMAN ROADS.

The current week has brought out two interesting and highly contradictory pieces of news with regard to the attitude of our government towards the railroads. On January 25, Attorney-General Bonaparte directed that a bill in equity be filed to set aside the control by the Union Pacific Railroad Company and its subsidiary corporations of the Southern Pacific and the San Pedro, Los Angeles & Salt Lake; also to have declared illegal the ownership by the Union Pacific or the Oregon Short Line of stock in the Santa Fe, the Great Northern and the Northern Pacific, it being alleged that all these lines are competitors of the Union Pacific and that they have conceived and carried out a conspiracy in restraint of trade. E. H. Harriman, Jacob H. Schiff, Otto H. Kahn, James Stillman, Henry C. Frick, Henry H. Rogers and William A. Clark are cited as individual defendants. Mr. Bonaparte has issued an official statement in which he says that the extended investigation by the Interstate Commerce Commission into the relations existing between the various roads engaged in transcontinental traffic, supplemented by independent investigations by the Department of Justice, has caused the department to arrive at the conclusion that the stockholding of the Union Pacific and its subsidiary companies in the other corporations mentioned above is in direct violation of the Sherman act. The department regards the suit as of great importance, since it seeks by means of it to break up what it refers to as the substantial monopoly of the transportation business of the country between the Missouri river on the East, and the entire Pacific Coast south of Portland on the West.

This news came out on January 25, as stated. On January 27, a conference as requested by the President took place in Washington, and some nine highly experienced railroad men discussed with him the question of modifying the Sherman law so as to minimize the restrictions now placed upon railroad pooling and traffic agreements for securing uniformity of traffic regulations and rates, etc.

It has, of course, for a long time been obvious to all careful economic students in this country that our national law has definitely taken two positions which are absolutely irreconcilable with each other. Through the Sherman law it has required competition; through the rate law of 1906 it has made it impossible. The doctrine of enforced competition is a subject too big to discuss here. It is sufficient to say that it has been the historic theory of most governments which did not own their railroads that competition between the roads should be required by law, although experience has amply shown that the law has never yet been successful in its efforts to sow seeds of dissension that should raise fruit of benefit to the public. On the other hand, evidence has been accumulating year after year which shows with incontrovertible definiteness the fallacy of the whole proposition as outlined by government.

It is now 36 years since the famous committee on railroad amalgamations was appointed in Great Britain. Charles Francis Adams, Jr., told us 21 years ago how this committee had showed with grim precision that in the 40 years during which railroads in Great Britain had been doing business up to the time when the committee made its report, English railroad legislation had never accomplished anything which it sought to bring about nor prevented anything which it sought to hinder. The cost to the companies of the useless mass of enactments (3,300 of them) had amounted to some \$400,000,000, yet the committee concluded that competition between railroads existed only to a limited extent and that it could not be maintained by legislation. The committee cited practical examples of the respective workings of amalgamation and of competition, and then stated that in view of such facts as these it was clear that amalgamation had not brought with it the evils that were anticipated, but that in any event long and varied experience had fully demonstrated the fact that while Parliament might hinder and thwart, it could not prevent it, and was powerless to lay down any general rule determining its limits or character.

Having thus quoted the British Parliamentary committee on the futility of attempting to enforce by law competition between railroads, Mr. Adams took occasion to comment that the whole theory under which the American railroad system was left to develop itself was founded on the same theoretical error which had prevailed in Great Britain; the supposition being then universally accepted as an axiom that in all matters of trade, competition, if allowed perfectly free play, could be relied upon to protect the community from abuses. Thus the efficacy of railroad competition, expressing itself in the form of general laws authorizing the freest possible railroad construction everywhere and by anyone, at an early day became

almost a cardinal principle of American faith. Yet said Mr. Adams, "it is found that wherever this characteristic (the natural monopoly of the railroads) exists, the effect of competition is not to regulate cost or to equalize production, but, under a greater or less degree of friction, to bring about combination and a closer monopoly. The law is invariable."

Well, it was 22 years ago when Mr. Adams wrote his book and it is now 36 years since the British committee reported, and materially longer since George Stephenson observed that where combination is possible competition is impossible. Yet to-day the government is attempting to tear apart a great and enormously useful railroad system because its form of organization is alleged to represent combination just as all great and useful railroad systems must represent combination, instead of competition which, in the days when rivalry had full swing in this country effectually prevented any railroad system from being either great or useful, in the fullest sense of both of these words. In the face of this action, however, the government appears to doubt the divine inspiration of the law which requires competition in all things—else why the conference of January 27?

A bystander unlearned in the law cannot help thinking that these two pieces of news in Washington have come out in the wrong order. If the government really thinks that the Sherman law is probably a foolish one, why does it not settle the conference on this point before it undertakes great new prosecutions under that law? While the chemist is still investigating our drinking water to see whether it is going to poison us, is it not better to drink something else for the time being?

What a Technical Journal Ought To Do.

It is a curious and interesting commentary on modern scientific and industrial development that book making cannot keep pace with it. The surgeon can learn the groundwork of his profession from recognized text books, but to keep abreast of the best current practice he must either see that practice, or hear it described, or read of it in the technical publications devoted to that alone; the lawyer can pass his bar examinations on the basis of his theoretic instruction at the law school, but to win cases he must read cases, as fast as decisions are handed down. The same thing has always been true of the work of the civil and the mechanical engineer; certain standard books on bridge design and on locomotive design have collected together a great group of cardinal principles derived from two generations of practical experience, but no text book has ever yet or will ever be able to contain a full record of progress as it is illustrated by the best current practice—a record corresponding to the cases which the lawyer studies and also to the cases of a different kind which the surgeon studies. As rule-of-thumb methods in engineering work have more and more given way to scientific methods it has been more and more necessary for the engineer to know just what was being done simultaneously in all parts of the world. Within the last decade, progress, greater than many people realize, unless they look back and count the mile stones, has been made in the application of scientific, definite and well understood methods to the operating, financial and traffic departments of a railroad as well as to the engineering department, and here again, the production of text books has utterly failed to meet the demand for information.

To fill this demand is one of the two great purposes for which a technical journal exists. Colonel Prout pointed this out with great clearness in a paper which he wrote for *Transport* (now incorporated in the British edition of the *Railroad Gazette*) in 1902. He cited the case of the costly and elaborate volume entitled *Modern Locomotives*, published at the end of 1900, which, in 1902, was valuable as history, but not as a description of current practice, while the greater branch of service, covering both traffic and transportation, was represented in no book at all that did it even the most meagre justice.

But important as that function of the technical journal is, its other function—the broadening of the individual for his own good and for the good of the whole machine—is far more important. There are many branches of railroad service, just as there are many branches of every other kind of service, that in their direct tendency are exceedingly narrowing. Thus, a division superintendent may be so anxious to get a record figure for the biggest trainload that he forgets that trainloading, like every other branch of railroad work, exists for the sake of moving traffic. Similarly, a very large and important collection of railroad accountants, last spring, forgot that their accounts were collected for the sake of use and not merely as a hot house collection of beautifully developed statistical plants. Narrowing down our discussion from technical journals in general to a particular class of technical journals, it is undeniably true that the great and fundamental value of a paper which tries earnestly and successively

to make a comprehensive study and give a broad view of railroad practice lies in its incentive at once to individual development and to team play.

The *Railroad Gazette* has recently been enabled to support this kind of theorizing in a rather remarkable manner. Some time ago, we addressed to all our readers a circular letter asking them whether or not we were devoting too much space to the reviews which we printed of annual reports. Our own point of view was that a proper and understanding review of an annual report constituted an extremely valuable part of the joint business of furnishing facts and furnishing incentives to usefulness; that an abstract of a report made only with an editor's blue pencil was not useful along either of these lines, because the facts which it presented were only half truths, and the conclusions that could be drawn from these half truths were of no service to anybody. Therefore, we had been making a series of thorough, careful and painstaking reviews, in which the information given in the reports was interpreted, measured by rules and standards applicable to all companies, and expanded with comment based on real information about the physical and financial status of the property, including the efficiency or lack of efficiency of its management. But all this took a great deal of space, and we sent out our circular letter of inquiry to see what the real opinion of our readers was about this matter.

We confidently expected that railroad presidents, financial officers, and banking houses would approve heartily of these reviews, because we knew that the work was done well; but in our weekly audience there are a great many more master mechanics, and chief engineers, and signal engineers, and general superintendents, and engineers of maintenance of way, than there are bankers and railroad presidents; just as in a well constituted regiment there is only one colonel and one lieutenant colonel, but there are two majors, 10 captains, 20 lieutenants and some 60 sergeants.

Our theories about the real use of a technical journal in training men to think and to see their positions as parts of a whole instead of as separate entities, received a most gratifying confirmation in the replies to this letter of inquiry. The total number of replies received was 335; say, in round numbers, one reply for 20 subscribers among officers. Twenty-seven of these 335 were inclined to think that we gave too much space to the publication of annual report reviews, 26 of them cast ballots which may be described as defective because they answered some other question than the question asked, and 282 said very positively that we were not giving too much space to the reviews and that they found them helpful and valuable in their work.

Now let us see who these people were. Comparing for the moment railroad financial officers with officers in charge of the roadway (including chief engineers, maintenance of way engineers and their principal assistants) we found, to our great interest, that three financial officers answered our letter, all of whom spoke enthusiastically about the reports; and that 41 engineers of roadway answered our letter. 39 of whom were heartily in favor of the report reviews. Thus, a financial officer writes:

"I consider this one of the greatest improvements the *Railroad Gazette* has instituted in the seven or eight years I have been a constant reader. I do not think you are giving too much space to the publication of annual reports and I have read every word of them."

This is what we expected and hoped for, although we would never have believed that he had read every word of these reviews unless he himself had told us so. But now observe the following replies:

"The *Railroad Gazette* is our most important source of information in such matters, and we feel that the space which you give to the statement and analyses of railroad reports is of great value." —*Consulting Engineers.*

"You have not given too much space to the review of reports. The comparisons you make, as, for instance, that of the Chesapeake & Ohio and Norfolk & Western, bearing on their class of traffic, difficulties of operation, department expenditures, etc., are all very interesting and valuable to an engineer, and I find them especially so in connection with the theory of railroad economics, as given by Wellington, Webb and others."

—*Consulting Engineer.*

"I take great pleasure in reading these reports."

—*Engineer Maintenance-of-Way.*

"I read, clip, index and file nearly all of the information in the annual reports as published by you."

—*Construction Engineer.*

"I read these reports with a great deal of interest."

—*Chief Engineer, Maintenance-of-Way.*

"Your articles are so admirably prepared and give the information desired in such convenient and systematic form that they must be extremely valuable to those whose interests lie in the department of operation, traffic and finance."

—*Bridge Engineer.*

"I should be very much disappointed if you were to discontinue the report reviews or give them in any more abstracted form than at present."

—*Right-of-Way Inspector.*

"I have had a great deal of pleasure and profit in reading the reviews

you refer to. I think them especially valuable to all persons engaged in any way in the railroad business in broadening their views lest we forget the ultimate object for which railroads are built and operated."

—*Assistant Engineer of Bridges.*

"I take great interest in these articles. I consider them one of the most valuable features of your paper."

—*Engineer of Roadway.*

"An analysis of these reports such as has been made is very important to every railroad officer."

—*Engineer Track and Roadway.*

"I believe that it is proper that your paper should broaden out and include such subjects rather than to follow along the narrow channel of technical matters only."

—*Chief Engineer.*

This is support from the permanent way department, and besides the 39 permanent way officers who approved, 18 civil engineers, two or three of whose replies were quoted above, expressed their entire approval of the work we had done along lines which apparently lay to a considerable extent outside of things in which they were directly interested.

Now let us see how the mechanical people feel about the reviews. We found one master mechanic, one shop superintendent and three men in the car and locomotive department who thought we gave too much space to report reviews; also an assistant engineer of tests, whose work is doubtless primarily mechanical. But the mechanical people who did read our reviews last year and who approved of them, come second on our entire list in order of precedence, to a total number of 28. Here are some of their letters.

"I do read these reviews with great interest; have got much information of value from them."

—*Superintendent of Machinery.*

"I consider them extremely valuable and have gone over them with a great deal of interest. They have enabled me to collect figures and data on the cost of operation that otherwise would not have been obtainable."

—*Superintendent of Motive Power.*

"I try to read them all."

—*Mechanical Engineer.*

"I have been very much interested in these reports and hope that you will find it convenient to continue them. The treatment accorded has been such that the reader is enabled to get the proper understanding of the subject."

—*Assistant Superintendent of Machinery.*

"We do read these reports. We cannot offer any suggestions that would improve the manner in which the subject has been handled by the *Railroad Gazette*. The fact that these reports are not actuated by the desire of pleasing the companies whose reports are reviewed makes them valuable, and I think your readers are convinced that that is your intention and effort."

—*Superintendent of Motive Power.*

"I read the reviews with considerable interest as they certainly give in a nutshell a pretty complete resume of the items in which all railroad men are interested and enable one to compare the results obtained on his own road with the results obtained on others."

—*Mechanical Engineer.*

"I feel that they have given me a better knowledge of the conditions on our road than I could have obtained in any other way."

—*Superintendent of Motive Power.*

Among men engaged specifically in railroad service, we got the largest affirmative vote, next to the permanent way and mechanical departments, from the superintendents, 16 of whom heartily endorsed the work we have been doing while three dissented. For example:

"I read everyone of them. I have been very much interested in the articles."

—*Superintendent.*

"I read most of them. I am very much interested in the reports as compiled."

—*General Superintendent.*

"I have read many of these with interest. The analyses of the subject have been so well handled that I cannot criticize them or make any suggestions of value."

—*Assistant General Superintendent.*

"I have read them carefully."

—*General Superintendent.*

Continuing up a step in the same operating line, we found that general managers and assistant general managers approved by a unanimous vote of the 15 who replied. One of the especially interesting replies is from the General Manager of a large street railway system in Wisconsin, as follows:

"I have learned more and gotten more valuable information which is useful in the electric railway business from reading these reports than I have from reading all the street railway journals published in the country. These unbiased and critical analyses, absolutely independent of the feeling of the corporation which is being discussed, I have held up to my friends in the street railway publication field as shining examples."

—*General Manager.*

From the steam railroad general managers we quote the following:

"I have read all but a few. These reports have always appealed to me as specially interesting as showing railroad people how a report of this kind can be analyzed and what deduction can be properly made from it."

—*Assistant General Manager.*

"I have been very much interested and have read practically all reports you have made public through your magazine."

—*General Manager.*

"I have not read one that I regarded too long."

—*General Manager.*

"While I cannot say that I have read everyone of them, I have read the

reviews of all the principal lines and I consider them the best that have been made public. I believe the work is the very best there is and that it ought to be continued."

—General Manager.

The total affirmative vote in addition to the officers already given was made up of the replies from persons whom we have classified as follows: Railroad presidents, 12; vice-presidents in charge of operation, 11; miscellaneous manufacturers, 17; manufacturers of cars and car specialties, 10; manufacturers of locomotives and locomotive specialties, five; signal engineers, seven; librarians, one; bankers, six; lawyers, statisticians, state railroad commissions and trainmasters, each three; bridge engineers, bridge manufacturers, purchasing agents, ticket agents and officers of coal companies, each two; also one favorable reply from each of the following: Traffic man, economist, assistant to president, industrial agent, contractor, locomotive engineer, chemist, superintendent of telegraph, yardmaster, passenger department, car accountant, passenger conductor, architect, timber expert; also 41 favorable replies which we have not attempted to classify by vocations. We will quote only a few of the replies to show the general range of interest and the point of view of people occupying a great many different kinds of official positions.

"I have read many of the reviews with interest as I can gather what I desire to know with less difficulty than by studying the annual reports, and the reviews save me the trouble of calling for such of the reports as I wish to see if they do not otherwise find their way to my hands. Permit me to say in this connection that the practice of the *Railroad Gazette* in regard to these reviews seems to me not only quite in keeping with its character as the railway journal of this country, but especially beneficial to the class of railway men who habitually read the *Gazette* in that it leads their minds to an intelligent consideration of the three principal elements of the railway question; namely, operation, traffic and finance. As a rule I think operating men are your best readers, in which I include the engineering department. Traffic men probably come next and those having to do with finance last. The tendency with operating and traffic men is to dwell upon their own particular branch of the service to the exclusion of the other two. Once in a while there is one bright enough to understand relative values and this man moves up, but ten to one of the successful operating men fall of such advancement as their ability in that branch of the service would seem to entitle them to because their minds are not trained to take a larger grasp of things. The articles referred to in the *Railroad Gazette* are calculated to stimulate this lack of interest in and appreciation of elements with which their duties do not ordinarily bring them into immediate contact."

—President.

"I have been a very great admirer of the manner in which this information has been presented through your paper."

—President.

"We have looked over these analyses and we find them in every way splendid. We think that your claim that they are better than those published in any other paper is not exaggerated; it is almost impossible to find a brief and fearless analysis of a railroad report setting forth the bad points as well as the good, and we congratulate you upon the straightforward method in which you have done this."

—Bankers.

"We appreciate very much the critical analyses of railroad reports contained in the *Railroad Gazette*, and the frank and full way in which you deal with the principal topics of such reports. We always read them with much attention."

—Bankers.

"These reviews are more interesting to the average railroad man, I think, than nearly any other railroad news item which might be published."

—Vice-President and General Manager.

"We read them every time, and we file them for reference, regarding them as of invaluable use to us."

—Vice-President and General Manager.

"I have no suggestions to make. I may say, however, that in your treatment of these reports I have found much of interest and value."

—Purchasing Agent.

"The articles constitute, in my judgment, the clearest and most complete and practical outlining of railroad doings that ever appeared in any railroad paper."

—Sales Department, Manufacturing Company.

"The writer has made it his practice to read these reports."

—President Bridge Company.

"The reviews are extremely valuable, and I read them with the greatest interest."

—Secretary, Rolling Stock Company.

"I think I can say that I read all of them."

—Trainmaster.

We have devoted a good deal of space to these replies because they show far better than could be shown by theorizing, what the actual helpful work of a carefully edited technical journal is, in broadening the outlook of the individual. We can safely assume that the trainmaster who read every one of these reviews got more out of them which will be of service to him in shaping his future career than any of the railroad presidents did.

The Railroads of India.

The railroads of British East India at the end of the year 1906 had an aggregate length of 29,098 miles, of which 802 miles had been opened in that year. A little more than half the mileage was of the 5-ft. 6-in. gage originally adopted for the Indian standard; but there were 12,254 miles of meter gage, and 1,419 miles of narrower gages (30-in. and 24-in.). The length of the railroads owned

by the state was 21,719 miles, but of these 15,614 miles were worked by corporations under contract with the state. The capital of these railroads was at the average rate of \$42,555 per mile. For the year 1906 their average gross earnings per mile were \$4,819, and their net earnings \$2,416, the working expenses having been a trifle less than 50 per cent. of the earnings. The gross earnings per mile were nearly 3 per cent. greater than in 1905; the net, 1 per cent. less.

The traffic of these railroads in 1906 was at the average rate of 367,948 passenger-miles and 376,807 ton-miles per mile of road, or equal to a daily movement each way over the entire system of 504 passengers and 516 tons of freight. On the railroads of the United States the corresponding figures were 155 passengers and 1,345 tons of freight each way daily. In India the passenger-miles and ton-miles are nearly equal; here the ton movement is nearly nine times as great as the passenger movement. That the passenger traffic per mile of railroad should be $3\frac{1}{4}$ times as great in India as here is sufficiently explained by the fact that there are more than 10,000 inhabitants per mile of railroad in India, and less than 390 here. The light earnings per mile of the Indian railroads is due to the very low rates on the large passenger traffic, and the comparatively small amount of the freight traffic. In 1906 the average rates received were 0.4157 cent per passenger-mile, and 0.808 cent per ton-mile. If we charge half of the mixed-train mileage (which is more than 30 per cent. of the whole) to each kind of traffic, the average train loads were 203 passengers and 191 tons of freight. No other country has so large an average passenger train load. The average earnings per train-mile (all kinds) were 124.9 cents gross and 62.5 cents net. There is probably no other country which has so low a cost per train-mile, which is very largely due to the very low wages paid to natives of India. These formed 463,108 of the whole number of employees, against 6,850 Europeans and 9,326 Eurasians—offspring of white fathers and Hindoo mothers. This is at the rate of 16.5 employees per mile of road.

Of the whole number of passengers 95 per cent. traveled third class, paying an average fare of 0.387 cent per mile. The first class passengers were but as 1 out of 367; but they paid a trifle more than 3 per cent. of the total passenger earnings, with an average rate of 2.224 cents per mile. The largest specified freight was coal—12,530,000 short tons. Next came 11,939,400 tons of grain and beans, 2,565,000 tons of flax seed and other oil seeds, 2,064,000 tons of salt, and not very much less weights of sugar and cotton.

In spite of their low rates, the Indian railroads are prosperous, partly because of their low capital cost, but chiefly because they are worked so cheaply. Their net earnings were 5.83 per cent. of their capital in 1906, and 5.92 in 1905. Additions of considerable extent are made yearly.

NEW PUBLICATIONS.

Economics of Railway Operation. By M. L. Byers, C.E., Chief Engineer Maintenance-of-Way, Missouri Pacific Railway. New York: The Engineering News Publishing Co.; London: Archibald, Constable & Co., Ltd. 1908. 672 pages; 6 x 9; cloth. Price, \$5.

Mr. Byers has endeavored to produce a book which will be to the science of railroad operation what Wellington's *Economic Theory of Railroad Location* has been to railroad construction, and he has probably succeeded. At all events, he has produced a standard reference book entirely different from anything now in print; a book which ought to serve a very useful purpose for a good many years.

The author makes a point which has often been brought out in the *Railroad Gazette*, that with the extremely rapid development of railroad transportation along special lines it has become more and more difficult to obtain a true perspective. The department officer too often works for the advancement of the department alone, losing sight of the broader interest of the stockholder; while the young man entering upon a railroad career finds it difficult, if not impossible, to obtain any very clear view of the relation of his work to that of other departments. Therefore, Mr. Byers has tried to bring into view the general outline of the mechanism of railroad operation as it is carried on to-day and to develop the principles involved.

The first chapter deals with organization and gives some very useful rules. For example, Rule 1 reads: "Provide a supreme authority at all points where action must be taken"; Rule 2, "Carefully and fully outline the authority and responsibility of each position"; Rule 4, "Avoid as far as possible making any person subordinate to two or more others, especially in regard to matters at all closely related." A full quotation showing the disadvantages of extreme centralization in matters of administration is taken from the report of the committee appointed by the British Secretary of State for War to consider the decentralization of the War Office business resulting from the breakdown of that department in the Boer war. In this same chapter on organization, the departmental and divisional types are clearly differentiated and the advantages and disadvantages inherent to each type are shown. A specimen

set of by-laws giving details of organization for a large railroad is shown.

The employment, education and discipline of forces receives full attention, with a good many helpful suggestions about appointment, promotion and education and the relations which brotherhood employees have to the total working force. Thus it is shown that in 1900 the Brotherhood of Locomotive Engineers had 35,010 members among a total of 42,837 engineers, whereas the telegraphers in 1900 enrolled only about a third of the entire force within their union. The third division of the first chapter relates to accounts and accounting and it is perhaps open to criticism on the ground that it is rather more theoretic than the case demands. The function and idea of the accounting system receives wide discussion, but we should suppose that the men directly engaged in this highly specialized branch of the business would want considerably more on the subject, while the men only casually interested would require considerably less.

The same criticism can be made of other parts of the book. Yet on the whole it must be admitted that the selection of concrete material to illuminate theory is quite good. Under the general head of reports, 60 pages are devoted to abstracts such as the following:

"Form M. W. 26 will be used by foreman water service for rendering monthly reports to superintendent of water service on or before the 10th of each month following that covered by the report, of cost of operating and maintaining all water stations in his territory."

The objection which the casual critic might make to the selection of this material is that it would be better either to show all the forms themselves or to refer to them in more general terms. However, we do not doubt that the 60 pages of definite examples like the above will have their use.

Under the general head of economic operation, which constitutes Part 5 of the book, and fills some 360 pages, each detail of the expense account is discussed at length with copious examples from the practice of specific railroads. Specific examples are shown at large of such documents as "Daily report of condition of boilers and fireboxes examined at X Station; Roundhouse No. —." The topic of transportation is then taken up, under 18 specific heads, from the standpoint of the division officer. Topic No. 1 is train rules; No. 4, foreign car-home-routing instructions; No. 15, yard service, etc. The standard code is given in full; specifications are shown for train order forms, etc., illustrated with cuts; preparation of the train schedule or time-table is fully discussed, and each of the detailed 18 topics receives careful and studious treatment. We have only the highest praise for this entire study of economic operation. It is admirably done and is by itself worth the cost of the book many times over.

Part 6 deals with analysis of operation and control of expenses, showing the difference between constant expenditures, which do not fluctuate with any ordinary changes in the amount of traffic; indirect variable expenditures, and direct variable expenditures. This analysis is well made, and is followed by discussion of the general balance sheet and general income account. The book then tells what an inspector of transportation ought to do, and gives a number of specific examples of such an inspector's work and of the kind of report which he ought to make. Control of expenditures is, of course, the underlying theme of this final section of the book, and the topic is handled in a thoroughly competent and satisfactory manner.

We should be very much surprised if there was an operating man to be found in the whole great group of highly trained American railroad officers who would not derive much profit and helpful suggestion from reading Mr. Byers' book, which seems likely to remain a standard work for a long time.

CONTRIBUTIONS

What Are We Going to Do About Railroad Accidents?

New York, Jan. 30, 1908.

AN OPEN LETTER TO NEWSPAPER EDITORS:

The appearance of the yearly accident bulletin is always occasion for expressions of horror in the great dailies, and too often with ill considered demands for drastic legislation. The *Evening Post*, sane and with fine traditions to live up to, asks a proper question which we prefer to think is addressed to the railroads, rather than to legislators. It says:

"If 5,000 persons had been killed and 76,286 injured in battle or in two or three accidents, the country would be aflame at the news. Because these casualties occurred on our railroads in the course of 12 months nobody pays much attention to them. The Interstate Commerce Commission gives the ghastly figures in its recent annual report. They bring up the question anew: 'What are you going to do about it?'"

The answer by railroad managers might truthfully be: "We are doing more than ever before; are making progress, but cannot be successful until we are allowed to control our employees." In the employment and discharge of enginemen and train crews the trade unions have rather more authority than the employers and except perhaps on the Reading and the Chicago, Burlington &

Quincy, which have paid millions for the privilege, dangerous men cannot always be weeded out. Nevertheless, many railroad officers do less than their full duty in organization and vigilance, and are legally and morally guilty of criminal negligence. The force of public opinion, which the newspapers aim to express and often influence, together with the enforcement of the present laws, is probably the only hope for a better condition.

TRAIN ACCIDENT KILLINGS.

While it is true that 5,000 passengers and employees have been killed on the railroads in the last year, nevertheless people generally accept this as meaning train accident killing and assume that all of it or nearly all of it can be stopped. This common belief is misleading and does a lot of harm. An "injury" is a variable, from a bruised thumb to a lost leg, and the minuteness of reporting varies on different railroads and in different countries, so that fair comparison can only be had from the more accurate records of those killed. Let us separate the items and try to see how much of the killing is within control of railroad officers, or of anyone: Only 1,421 people were killed in train accidents. Of these, 776 lost their lives in collisions, and it is quite nearly true to say that every collision is due to disobedience of orders—a lack of discipline—so that at least this much is pure waste and can be stopped. Of the 515 lives lost in derailments this is nearly but not quite so true. A detailed examination shows that at least 22 of these lives could not have been saved by the railroad man's vigilance. Unusual disturbances by the forces of nature and malicious interference are beyond control. Also by no means all these derailments were due to a lack of discipline; a considerable proportion, fully one-fourth, were caused by defects in equipment, preventable, but not by the same methods. Equipment includes the roadway and its structures, as well as all rolling stock. One hundred and thirty lives were lost in unclassified train accidents, and these cannot be analyzed fully, except that we find the same causes, human errors, defects of equipment and uncontrollable elements.

The other killings which go to make up the total of 5,000 are 3,579 lives lost on the right-of-way, and a careful examination of these losses is most instructive. For example: Seven passengers lost their heads by sticking them out of windows, and 147 passengers were killed while trying to save time in getting on and off trains. Due to the same foolishness, more than 2,000 passengers were wounded—self-inflicted injuries, beyond the control of others.

THE HUMANE EFFECT OF SAFETY DEVICES.

In coupling and uncoupling cars, 302 employees lost their lives last year. In the year 1890 a greater number, 396, were killed while doing that work, although the number of freight cars in service has considerably more than doubled during the period and the yard and terminal work has increased by a much larger proportion. This subject is worth a little further study: Railroad accident statistics show, uncertainly, that 15 are injured for each one killed; but in car coupling accidents the ratio is about 23 to 1. In 1890, 7,842 were injured while coupling—less than half as many cars were coupled as last year, when only 3,948 were injured; that is to say, more than 75 per cent. of these injuries have been eliminated. We may assume that this relative reduction in killing and wounding is entirely due to the use of the automatic car coupler.

In tending switches and other similar work about trains, 310 were killed this year. This, too, is a proportionate reduction, due to the increasing use in busy yards of a power movement of switches in connection with the interlocking machines.

In contacts with overhead bridges and structures 142 lives were lost last year. The method of classifying accidents has been changed so that we cannot in this case make exact comparisons, except that here there has been an enormous reduction, due entirely to the invention of the Westinghouse air-brake, with the result that brakemen rarely need to ride on the freight car roofs.

KILLING TRACK LABORERS.

There remains unclassified the large number of 1,873 lives lost on the railroad right-of-way. Perhaps the largest single item is the killing of trackmen. The foreman of a track gang has a heavy responsibility. He knows the time table and watches his timepiece, but he needs to be alert and watchful for extra trains and light engines. Nevertheless, foremen vary in alertness, and the killing goes on. These workmen, Italians and the like, are apt to be stupid, but with a low cunning. In night work it is difficult to keep track of them and protect them. They will skulk and be found dead on the track behind a passing train. Material improvements have been made in methods of watching out and warning, but we need not expect much reduction in this kind of killing.

WE CAN SAVE 1,000 LIVES.

It would seem, therefore, that only a small reduction can now be made in the above mentioned total of 3,599 lives lost outside of train accidents. It appears also that nearly all of the 1,421 lives lost in train accidents would be saved if there were strict obedience by employees and if the design and material of rolling stock and permanent way were perfect. Perfection is not attainable in this world, and therefore a somewhat careful examination has been made of the accidents which involved these 1,421 lives.

Without going into detail, it does seem possible to reduce that loss by two-thirds—that is to say, our problem is limited to the saving of 1,000 lives of passengers and employees a year in railroad operation.

THE GENERAL MANAGER'S RESPONSIBILITY.

The newspapers have taken as a text the remarkable exoneration of General Manager Smith from responsibility for the fatal derailment on the electrical division of the New York Central—remarkable because the Court decided, without allowing the jury to consider a verdict, that the evidence showed a full measure of energy and caution in the use of equipment and the choosing of men. This is all that the manager can do, but he will be held to higher standards than we have had heretofore. The stenographer's report of the Smith trial makes a ponderous volume, including most of the material for a text book on train operation, and is inspiring in suggested possibilities of inspection of materials and men. Inasmuch as this railroad has been under severe fire, some details of its methods of improving discipline are worth noting. Some of the same methods are used on other roads.

TRAINMASTERS.

This not-quite descriptive title is given to the four or five men employed on each engine division to spend their entire time on the line, riding in freight-train cabooses and on passenger trains and being at signal cabins and stations—wherever train movement can be observed. They are field inspectors of operation, such as engine-men's obedience to the signal indications, and their compliance with the rules for giving whistle signals at crossings and for sending out front and rear flagmen. They watch for infractions of safety rules by conductors, brakemen, towermen and station men. To prevent their being regarded as simply spies or detectives, they are given a measure of authority to deal privately—warn without reporting—with first offenses and make recommendations in favor of efficient men. They make "surprise tests"—for example, go to an automatic signal post and hold the semaphore and light at the caution or stop position and see if the engineman is alert in obedience.

INSPECTION AND PUBLICITY.

The New York Central has also, within the past year, put in effect a plan which seems to be original. An expert investigator, whose ordinary work at headquarters is such that he can leave at a moment's notice, proceeds at once to the scene of an accident that is serious or involves a lesson, and joins the division engineer and superintendent in an investigation and report. Mr. Brown, Senior Vice-President, writes: "The expert investigator's duties are, primarily, to bring out any wrong practice that may exist and which, if it had not already done so, might lead to an accident. I hope that with experience these special investigators, of whom we have two east of Buffalo, will become such authorities that the cause of an accident will be quickly determined and full of accurate information given to the press."

The establishment of an inspection department, thoroughly organized, primarily to insure strict observance of rules, was probably original with Julius Kruttschnitt, now Director of Maintenance and Operation of the Harriman lines. He appointed an Inspector of Train Service, and he and his staff have done great things on the Southern Pacific. The work covers cleanliness, ventilation, heating and lighting of cars and stations; neatness and good manners everywhere; excessive speed, schedule failures, neglect to flag and running past signals. These latter dangerous practices have been nearly eliminated. Mr. Kruttschnitt in his plan recognized the fact that neatness and orderliness are closely allied to uniform obedience to orders. It is surprising that this departmental method of administering discipline has not found favor on more railroads.

On the Chicago & North-Western and on the Rock Island—and probably on other roads—there is an interesting undertaking for the triple purpose of promoting discipline, establishing frank relations with the public and getting, or holding, business. There is a fixed, compulsory, monthly meeting of division superintendents, and at this conference all that pertains to these subjects is discussed. Each officer then goes slowly over his division, keeping his eyes open and examining each station agent. He stays long enough in each community to make calls on shippers and others who have complaints or are otherwise critical and disaffected. If a frank exchange of views and facts can accomplish a better understanding, as it generally does, his work is done, for, as President Winchell expresses it, "he has no time to call on our friends, he must see the men who paint us black."

DEFECTIVE EQUIPMENT.

During the present winter a succession of rail breakages prompted a thorough inspection of about 80 miles of track—cleaning the sides of the rails with steel brushes and looking closely for flaws. Twenty-six cracks were found, all ripe for breaking and disaster. And even now, after this inspection, they are breaking on this short piece of railroad an average of one rail a week. It is only by sleepless vigilance that these accidents are prevented. The bad rails forced on the railroads under conditions which have made them helpless for several years make a story too long to be told here. The cause is greed, and it is only because of united action

by all the railroads, through the American Railway Association, that there is now hope of reforming this outrageous situation.

The freight car travels from Maine to Texas—and the Lord have mercy on it if the Texas State Commission should notice anything assessable in it! They might levy on its grab irons for taxes. The quality of material in its sills, cast-iron wheels, brake-beams and brake riggings, draft gear and coupler knuckles, varies with the grades, loads and speeds of the owning railroad, and also with the quality of its officers. Foreign cars form a large proportion and are mixed in long freight trains on any trunk line. On a descending grade the long-applied brake shoes heat a cheap cast iron wheel. It explodes and wrecks the train. Due to poor material, brake-beams fall, knuckles and flanges break and draw-bars pull out with like results. There is no known means of preventing, under unfavorable circumstances, a passenger train from derailment by the debris from a wrecked freight train on an adjoining track.

THE 6,330 "OTHER PERSONS" KILLED.

Before studying out the ways in which the railroads can reduce the number (5,000) of passengers and employees killed, it is necessary to look at the much larger number of "other persons" killed by railroad trains, and not included in the Interstate Commerce Commission Accident bulletin. In 1906 (these returns for 1907 are not yet available) 6,330 people other than passengers or employees were struck by trains and were killed. Concerning this greater killing we have never seen serious mention and consideration in any daily newspaper. Of those so killed, 5,381 were trespassers, mostly tramps, but including many women, children and other not alert persons walking for short distances on the tracks. The railroads spend large sums and try hard to persuade the community to enforce the laws of trespass and vagrancy—to get rid of tramps who steal and destroy railroad property, cause wrecks and get killed. Under Mr. Loree's administration of the Pennsylvania Lines West an orderly and measurably successful undertaking to this end was made among the communities along the lines. That region is said to be now one of the least infested. Their tramps have simply moved to other fields of harmfulness.

During the year, 926 presumably good citizens were killed at highway crossings of railroads; proportionately as real a loss to the country as the 1,421 lives lost in train accidents. The elimination of a grade crossing usually requires joint action by the community and the railroad. The state of Massachusetts stands alone in cordial co-operation with its railroads for this desirable end. New York and other states have good laws, based on the Massachusetts plan—the state to pay one-fourth, city or town one-fourth and the railroad one-half of the cost of eliminating grade crossings. It is the railroad's interest to effect these changes in order to avoid the cost of slow-downs and killing, but it is only by strenuous effort, pressure, argument and persuasion that some small progress is made in this humane and economic reform.

THE POSSIBLE REMEDIES.

The General Manager is responsible and has the power to stop most of the loss of 1,000 lives in collisions and derailments. It is hard, but he must. Perhaps his most difficult problem is getting obedience and weeding out inefficient men. The trade unions are arrayed against him, but his disciplinary work is essentially military and he cannot succeed until he gets a high quality of military discipline throughout the entire operating force on train and track. We have said that the General Manager will be held to higher standards than heretofore. We need no new statutes. The law of criminal negligence is good; it needs only to be enforced. Judge Kellogg showed plainly in his summing up of the evidence in the Smith trial that if he could find any lack of extreme caution in making an operating organization for the Electric Zone; in delegating authority to anyone without an unassailable record; in making a working schedule without excessive speed; in training and examining motor men; in having a high standard of maintenance of way and rolling stock—for any lack of a full measure of vigilance and caution the General Manager must go to jail. Criminal prosecutions do good, although it is an agonizing experience for a faithful officer.

The present rate of killing nearly 1,000 persons a year at grade crossings has been a necessary incident in our method of developing new country by cheaply built railroads and city and town streets. This pioneering method has made our country rich. But long ago the time came when the elimination of these grade crossings was both humane and profitable, and it is now the communities and not the railroads who are at fault. Right-minded editors of newspapers can do much for this reform.

The killing of 5,381 trespassers on railroad tracks is largely the fault of government, whose primary duty is police protection of citizens. The amount of this killing is appalling, but it only touches the edge of the harm done every year by tramps. They ravage the country, wreck trains and get killed. The subject is so big, and its effects so wide, that its concern to the railroads becomes only incidental. Nevertheless, the railroads have a plain duty to spend money and work energetically with any community that tries for improvement.

W. H. BOARDMAN,

Editor of the Railroad Gazette.

A Compound Rail Section.

Crafton Station, Pittsburgh, Pa., Jan. 21, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The general shape of the large American T-rail is not in harmony with the fundamental principles of rolling, and prevents a natural conformation of the metal. Two factors are responsible for this condition; first, the established mechanical relations in the roll passes; second, the temperature maintained by certain parts of the rail during conformation. Higher temperature can be held in some parts by simply increasing their thickness, but the proper mechanical roll effects cannot be had without altering the form of the section.

Some parts of a standard rail are formed in a manner which, if permitted to continue, would subsequently help improve the internal character of the material, while other parts of the rail are formed in an unnatural way which curtails the process of forming. In other words, if a difference of mechanical effect is present in separate parts of an integral section the final finishing of the whole is governed by the part of the rail which assumes refractory conditions first. This physical condition will prevail in rolling the thick or thin flanges, since no effective change can be made in the mechanical action of the passes. However, within prescribed proportions this physical disparity can be controlled by proper mechanical application of the different diameters, but while it has had the effect of getting out the section, it has never eliminated the use of auxiliary apparatus and artificial requisites.

Small T-rails are rolled and finished without artificial assistance, although, to a degree, they are unbalanced. Middle sized sections require subsidiary apparatus to overcome progressive irregularities in curvature (metal flow) and physical distortion, and large sections invariably require the aid both of artificial and of me-

base. The thickening of the whole flange is only a temporary adjustment and will not suffice for the successful rolling of structurally good rail above certain sizes. The many troubles which are associated with the manufacture of the present large standard rail give evidence that the limit of an unnatural mechanical treatment has been reached.

If a change in the design must be made to gain a natural conformation of the metal, it should be one infinitely capable of fulfilling the mechanical requirement in rolling still larger rails. If the present design will not conduce to a natural development of a rail shape, how are the larger sections going to be benefited by the same mechanical treatment?

A suitable metal distribution offering the proper mechanical applications in the roll passes should be made now, for the reason that a natural conformation will contribute to the betterment of the structure. Reliable results cannot be acquired in any other way without working injury to the material. The best internal characteristics are gained by treating the metal decently in the initial stages of rolling, and similarly throughout the whole process of forming, not relying on treatment after the final form of the rail has taken place.

A practical way to gain the mechanical roll effects which would elongate the metal in a natural way at the head and base of a section is to use a section which may be described as being a combination of the double-head and American types. In this form the section assumes a contour susceptible to mechanical influences which have benefited the character of the double head rail. The good granular condition of the double-head rail is well known, but the principal reason for its superiority has never been thoroughly investigated. The ease with which a double-head rail can be rolled is due to its symmetry about the horizontal and vertical axes, so that an equal amount of reduction can be placed over all. Most

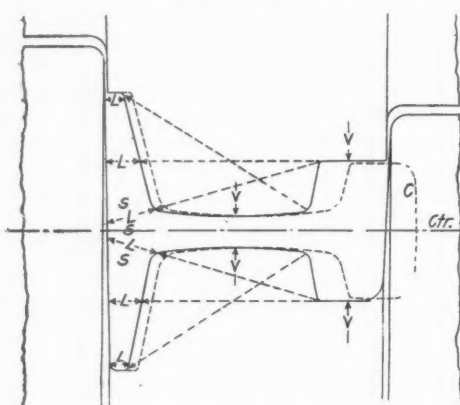


Fig. 1—Roll Groove for Standard Rail.

V—Vertical compression. S—Strained area.
L—Lateral compression. C—Deeper section.

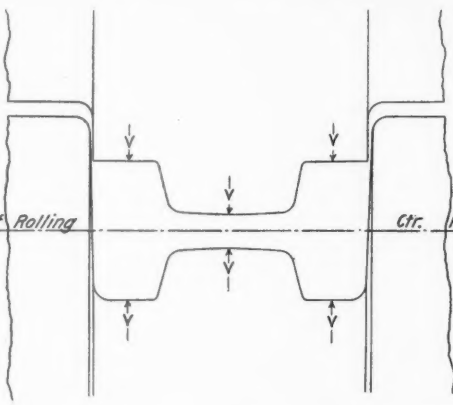


Fig. 2—Roll Groove for Double-Head Rail.

V—Vertical compression.

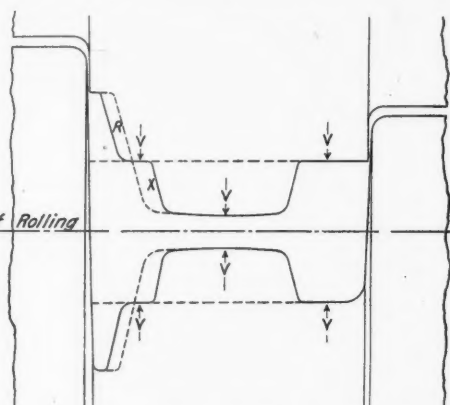


Fig. 3—Roll Groove for Flat-Bottom Double-Head Rail.

V—Vertical compression.
R—Material removed to X.

chanical means. It can readily be seen that the development of the final form is, and always has been, at the expense of the structure, while independent means, other than the rolls themselves, must be applied to arrest excessive distortion.

With every enlargement of the standard rail section the necessity for independent mechanical assistance during and after the rolling has increased. This proves that the shape of the standard rail does not furnish the proper mechanical conditions in the roll passes and is at variance with the fundamental principles which would benefit the material while rolling. It also indicates that the present method of shaping rails pretends to be nothing more than a means to form them.

Since medium sized standard rails are not in harmony with natural and fundamental principles for conforming the metal, it follows that larger unbalanced sections must have a greater disadvantage in rolling. Experimenting with small thick flanged sections will not guarantee internal improvements in larger sections, because every section has an individual relation with the center line of rolling. If the general shape of a T-rail establishes the center of gravity near the flange in smaller types of rails, and the same shape is preserved in the larger sections, there is no denying that there will be greater curvature and longitudinal tension in the metal while it is being elongated.

Because the head of a standard rail is formed by co-acting vertical pressures, which are positive, progressive, and cause a free flowing of the metal, these pressures disagree with the mechanical conformation at the base of the rail. The flange is formed by lateral pressure of roll surfaces varying widely in diametrical speed from the center line of rolling. They are slow and retarding, and the metal compressed between them is operated upon irregularly and elongated unequally. Even if a higher temperature can be maintained in the flange part of a rail it will not obviate this mechanical condition in the roll passes, nor will it remove the cause which sets up longitudinal tensions in the metal at the rail

of the reduction of metal is thus accomplished in the line of least resistance, which is fundamental.

An equal diametrical compression of co-acting roll surfaces on the head and base elongates the metal freely on both sides of the section, causing a true rolling motion. The elongation of all parts in line of least resistance eliminates internal straining and prevents any inclination on the part of the metal to flow laterally. In the standard rail the metal to form the flange is greatly reduced over that which is to form the head and naturally minute flaws move more readily toward the rail head. If the metal can be made to flow uniformly in one direction only, a far better opportunity to refine the metal is presented.

During and after the conformation, similar parts of the double-head rail cool evenly and more or less separately, therefore the chill does not travel toward either head, and a coarse, crystalline structure is avoided.

As said before, a uniform elongation of material by co-acting roll surfaces equidistant from the center line of rolling eliminates longitudinal tensions; hence internal straining is not set up, and rolling can be continued to lower degrees of temperature without fear of distortion. To finish rolling a rail at the critical point in temperature is desirable and has its benefits, but the character of the material can be enhanced by approaching that degree in heat with a more gradual reducing of the metal. It is not generally known that heavy reduction per pass is out of all proportion to internal concentration and the natural contraction of the crystals. The harder the material, the more destructive is the process, and the greater the necessity for a gradual natural conformation.

If a symmetrical figure is primarily responsible for good structural results, the principal factors involved should be embodied in a flat-bottom, double-head rail. The effective mechanical action in the roll passes which will assist in a natural treatment of the metal can then be gained. A vertical compression of roll surfaces is positively necessary on the base of the rail to advance the metal at an

even rate with the head. If applied at the proper place on the flange it will be the means of equalizing the elongation or flow of the metal. The cooling of the separated heads in the double-head section is more or less independent, with an alternating radiation of heat from similar shaped parts through the web, the effect of which subsequently anneals the whole section.

By assuming a similarity of parts, approximately those of the double-head rail, a combination section can be designed in which a uniform heat radiation is possible in all parts of the rail. This factor, together with the proper metal distribution, would undoubtedly extend the workable state of the metal. The continual working of the metal to form the combination section with light reductions per pass, accompanied uniformly with an equal contraction of the metal, will give a dense homogeneous structure.

The metal in a thicker flange section can be distributed to better advantage by removing it from the flange points and placing it within vertical lines corresponding with the width of the rail head. This transfer of the metal from the flange points to the base of the web is the point where the mechanical influences of the roll passes are gained, and it will make the rolling of extremely large rails possible.

By placing the metal in the base of the rail in a form cor-

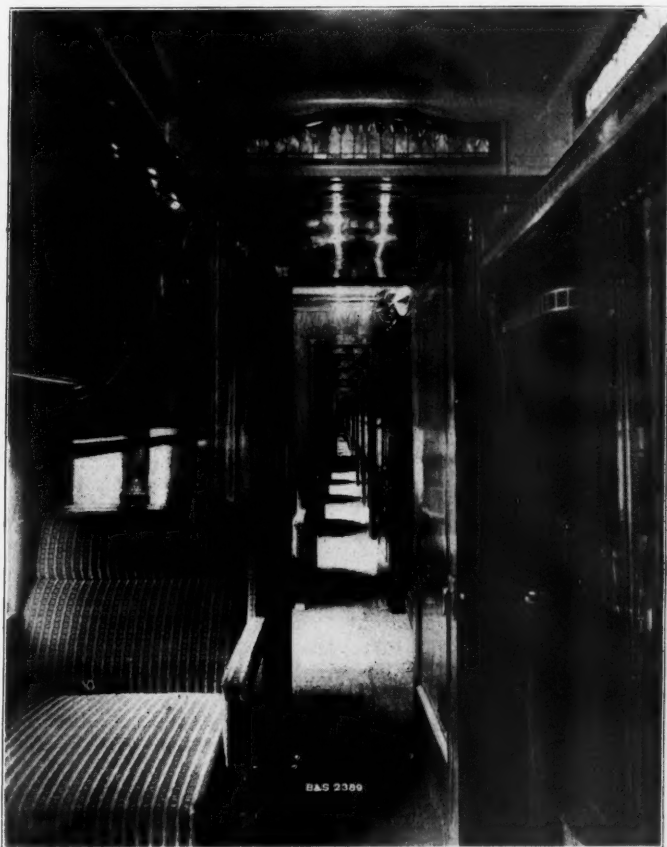
any more than bread can without the proper amount of kneading.

Considering all the conditions in rail making up to the rolling there is no factor as important as the mechanical treatment. It is what gave enduring quality to the "John Brown" rail. It is what will give character to any piece of metal. It is one of the principal factors which will prolong the use of the Bessemer process, since analytical conditions of the material tending toward brittleness can be overcome and benefited by a natural conformation, more roll passes, less reduction per pass and a final cooling which is at the same time uniform and more or less self-annealing.

A. W. HEINLE,
Consulting Roll Turner.

New Compartment Sleeping Cars for the New York, New Haven & Hartford.

The accompanying photographs show interior views of one of the two compartment cars recently built for the New York, New Haven & Hartford by the Barney & Smith Car Co., Dayton, Ohio. They were delivered on December 19 and 20, 1907, and immediately put in service between New York and Boston. They are 71 ft. 6 in. long, over sills, and 78 ft. 5 in., over platforms. Each has 10 state-



Interior View; N. Y., N. H. & H. Compartment Car.



Stateroom; N. Y., N. H. & H. Compartment Car.

responding to the general shape of the head, a vertical roll pressure is applied midway between the flange points and the foot of the web. By so doing there is gained an active mechanical advantage of 50 per cent. over the established conditions for forming the standard flange. The delivery of the base is then as positive as shorter flanges beginning at the web. If the only true rolling action, which drags the metal through the passes, is exerted at the converging of the flange and web, the presentation of a like influence higher up on the flange will make the forming of still longer flanges possible. The true mechanical advantages the flat-bottom double-head rail will permit of, together with its ability to equally distribute the heat throughout all the parts, and principally the base, enables the whole section to go through any number of roll passes consistent with the workable state of the metal. The number of roll passes to be used would then depend on the comparative reduction per pass and the diminishing of the heat. By this arrangement the speed of the rolls could be increased, reduction per pass reduced, and more roll grooves added, or, less reduction per pass at the present speed of the rolls with enough additional grooves to reach the proper finishing degree in temperature without ceasing to work the metal. Actual practice will prove the usefulness of not less than 28 or 30 passes, according to the size of the section. However, all these advantages will depend on the specific shape of the rail and its successful passage through the rolls. The physical improvement which can be gained in rolling cannot be created in the laboratory as some are prone to believe. Rails cannot be made good regardless of the mechanical treatment,

rooms with upper and lower berths and toilet facilities. The passageway runs along the outside of the staterooms. One of the photographs gives the impression that there is a corridor running through the staterooms. This is because the doors between them are all opened. With these doors it is possible to arrange the rooms in suites. The rooms are 6 ft. 3 in. long and 6 ft. 9 in. wide, the passageway taking up 2 ft. of the width of the car. There are lockers at each end of the car and at one end is a general toilet room. The lighting is by both electricity—generated on an axle-light system—and gas, with a combination chandelier in each section and a berth light at each seat. The corridor has deck electric lights and bracket gas fixtures. Each room is fitted with an electric fan. The windows, each 2 ft. 4 in. wide, are in pairs, with upper semi-elliptical panes of art glass. A particularly interesting feature of the interior finish is the variety of woods used.

Stateroom A is finished in courbaril. The trade name in the United States is Blanchet wood, so called from the name of the importer, who says that this special importation came from the island of Martinique shortly before the last volcanic eruption. The same wood is known in the West Indies as locust, in Panama as algarroba, in Brazil as jabai, and in Guiana as simiri. The tree grows to enormous size and great age in most parts of tropical America. Immense buttresses form at the trunk, frequently so large as to make the diameter 60 ft.

Stateroom B is finished in Peruvian mahogany, so named by Barney & Smith. It was first introduced into this country two or three years ago. The native name is quitacalcan. It is used exten-

sively at present for high class interior finish and sometimes for furniture.

Stateroom C is finished in what is known as true or Spanish mahogany to distinguish it from other varieties. Real Spanish mahogany grows in Cuba and San Domingo, but in the latter country it cannot now be obtained in practicable sizes. The wood used in this stateroom is from the mountains directly back of Guanatanamo and Santiago, Cuba. It is said that it often takes 12 oxen from three to four weeks to haul a single log from stump to shipping point.

Stateroom D is done in jique, the name being native Cuban. It is somewhat like mahogany. This particular variety is seldom imported into this country.

Stateroom E is in tigerwood, so-called from its mottled appearance. It comes from Africa and British Guiana, where it is known as itaka or itiki wood.

Stateroom F is finished in East Indian walnut, otherwise called koko, from Rangoon, India.

Stateroom G has the distinction of being finished in a wood of whose origin nothing definite is known. The Bureau of Forestry is investigating. It is called Moro wood and is supposed to be from the East Indies.

Stateroom H is in Circassian walnut, sometimes known as French walnut. This importation is from the Caucasus mountains.

Stateroom I is in padouk, from the Andaman islands, south of India. It is also known as vermilion, East Indian mahogany and Burmese rosewood.

Stateroom J is in English oak.

The corridor and other public parts of the car are finished in mahogany. The design of the seats is simple and the upholstery is in keeping with the elaborate wood finish.

New Law Affecting Foreign Patents in Great Britain.

BY JOHN P. O'DONNELL.*

The Patents and Designs Act of 1907, which finally came into force on Jan. 1, 1908, in addition to various alterations in the previous acts and in the practice thereunder, introduced some striking innovations. The principal points in the act may be set forth briefly as follows:

Working.—At any time not less than four years from the date of a patent, and not less than one year after the passing of this act (i.e., Aug. 28, 1907), any person may apply to the Comptroller for the revocation of a patent on the ground that the article or process covered by the patent is manufactured or carried on entirely or mainly abroad. This is practically on all fours with the working clauses in the patent laws of most of the European countries, which compel patentees in those countries to actually manufacture the patented articles in the countries within varying periods (generally three years) from the date of the patent.

This working clause practically amounts to a protective clause, which renders a patent liable to be declared void if articles made under the patent are manufactured abroad and imported into this country.

The Comptroller may either order immediate revocation of the patent, if he is satisfied that there are no good grounds for the non-manufacture, or he may allow a reasonable time within which manufacture on a commercial scale sufficient to supply the demand in this country must take place, and if manufacture is not commenced within that time, he may then order the patent to be revoked.

An order of the Comptroller revoking a patent under this section of the act is subject to an appeal to the court.

Patents of Addition.—Patents of addition may be obtained for improvements or modifications of inventions covered by a specification on which an application for a patent has been filed, or on which a patent has been granted. Such patents of addition are limited in duration to that of the original patent and expire therewith. No renewal fees are payable on patents of addition.

Provisional Specifications.—An applicant for a patent having filed two or more provisional specifications for kindred inventions or inventions that are mere improvements on or modifications of those covered by the preceding specification or specifications may file a single complete specification including the subject matter covered by each of the provisional specifications, and if the Comptroller is satisfied that the combined subject-matter of all the provisional specifications constitutes a single invention, he may grant a single patent thereon, and such patent shall be dated as of the date of the first provisional specification. In relation to questions of validity and for the purposes of oppositions to the grant of patents, however, the dates of the respective provisional specifications will be taken into consideration.

Opposition to Patents.—Three important changes have been made in regard to oppositions to the grant of patents, namely, (1) the second ground of opposition under the old act has been amended so as to permit of opposition on the ground of any complete specification

on an application for a patent of prior date; this will include any complete specification whether or not such complete specification has been accepted and published before the date of the patent the grant of which is opposed, and also includes specifications filed under the international convention; (2) a further ground of opposition has been added under which the grant of a patent may be opposed on the ground that the invention or the manner in which it is to be carried out is not fairly or fully described in the complete specification, and (3) the Comptroller may award costs in respect of oppositions.

Further, the Comptroller may require oral evidence instead of or in addition to any declarations filed in an opposition.

Revocation of Patents.—The Comptroller may, on an application made within two years of the date of a patent by any person who would have been entitled to oppose the grant of the patent, revoke the patent on the same ground or grounds on which the grant might have been opposed. This practically means that the period of opposition to the grant of a patent is extended to two years.

The Comptroller's decision is subject to appeal to the court.

Search as to Novelty.—In relation to the 50 years' search in the records of British patents, made by the Patent Office examiners under the Act of 1902, in respect of all complete specifications filed, the Comptroller has, under the new act, the power to refuse the grant of a patent if he considers the invention claimed to have been completely claimed in any prior patent within the 50 years. Under the 1902 act the most the Comptroller could do was to insert a specific reference by number and date to such an anticipating patent.

An appeal may be made to the law officer from the Comptroller's decision refusing the grant of a patent under this section.

Further, the new act provides, by a special section, that the search shall extend to specifications published after the date of the application in respect of which the search is made. This brings in specifications on applications filed under the provisions of the International convention, and which may be actually deposited or filed at the British patent Office subsequently to, but on which the patent when granted would bear an earlier date than that of, the application in respect of which the search is to be made.

Restoration of Patents.—The Comptroller has power to restore any patent which has lapsed owing to the failure of the patentee to pay the renewal fees at the proper time or times. Any application for restoration of a patent is, however, subject to opposition by the public, and the Comptroller's decision is subject to an appeal to the court.

This procedure is much cheaper and simpler than under the old acts, which necessitated all the trouble and heavy cost of obtaining a special act of Parliament to restore a patent.

Compulsory Licenses.—Any interested party may petition the Board of Trade for the grant of a compulsory license under a patent or for the revocation of a patent on the ground that the reasonable requirements of the public in regard to the supply of the patented articles have not been complied with, and if the Board of Trade is satisfied that a case has been made out, the petition shall be referred to the court; the court shall decide either to dismiss the petition, to grant a compulsory license, or to revoke the patent, according to the circumstances of the case.

Contracts for Sale or Licenses of Patented Inventions.—All agreements or contracts for the sale or license of patented inventions containing (a) any condition prohibiting or restricting the purchaser or licensee from using any article supplied or owned by any person other than the seller or licensor, or (b) containing any condition requiring the purchaser, or licensee, to purchase any articles from the seller, or licensor, or his nominees, and not covered by the patent, shall be null and void in respect of such conditions.

Further, any contract containing conditions as above set forth and made before the passing of this Act may be canceled by either party giving three months' notice in writing to the other, the party giving notice, however, being liable to pay compensation either to be agreed upon by the parties or, failing an agreement, to be settled by arbitration, the arbitrator to be appointed by the Board of Trade.

Further, any contracts relating to the leasing or licensing of a patented article or process, whether made before or after the passing of the act, may, providing the patent or patents has or have become void, be canceled by either party by three months' notice in writing; but where such notice is given in respect of a contract made before the passing of the act, the party giving notice is liable to pay compensation to be agreed upon by the parties or to be settled by arbitration.

Marking of Patented Articles.—All patented articles must be marked with the number and year of the patent in addition to the word "patent" or "patented"; otherwise a patentee may be unable to recover damages in respect of infringement.

Designs.—The new provisions relating to designs are briefly as follows:

If an application for registration of a design is not completed within 14 days after the expiration of 12 months from the date

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of application, the application will be deemed to be abandoned. The Comptroller may give a further extension of 14 days in exceptional cases.

The duration of a design may be extended under the new act to 10 or 15 years, instead of, as under the old act, being limited to five years.

If a design is worked mainly abroad, the Comptroller may, on an application by an interested party, cancel the registration.

A design registered in one or more classes of goods may be registered by the proprietor of the design in some other class or classes.

Generally speaking, all articles covered by registration must be marked.

I have given above the most important provisions of the Patents and Designs Act, 1907, but there are other modifications of and additions to the old acts, which are, however, mainly in the nature of details relating to procedure. For instance, the act provides that models and samples of inventions may be called for. Further, the Board of Trade has power to increase the amounts of renewal fees payable for the maintenance of patents, but I am glad to say that, according to the new rules of practice recently issued and consequent upon the new act, the renewal fees remain, at all events for the present, the same as before.

Act Retrospective.—The act is retrospective, and will therefore apply to patents and designs granted, and also to those pending, before the commencement of the act.

The Alberton Cut-Off of the Baltimore & Ohio.

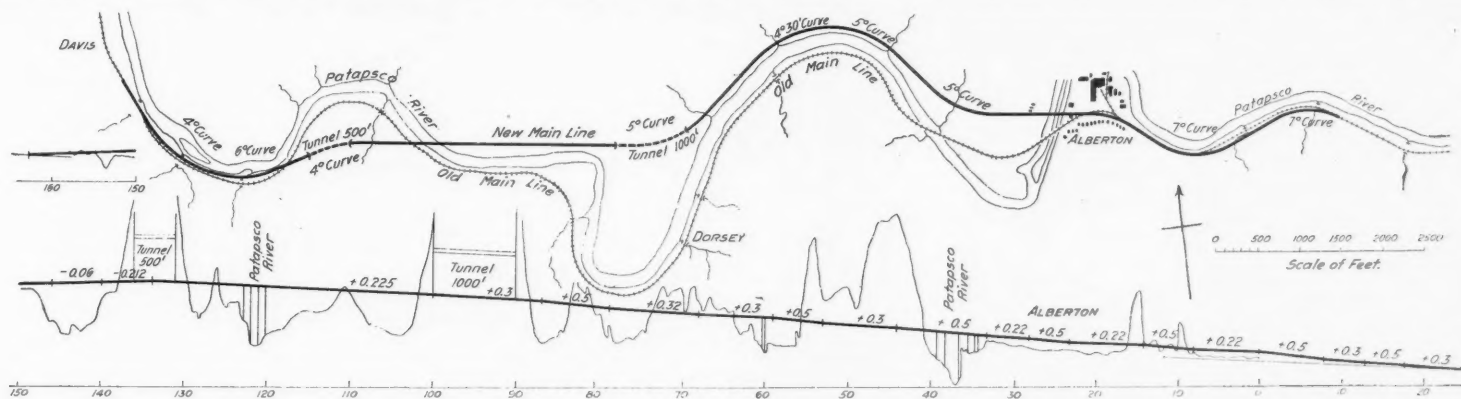
The Baltimore & Ohio has recently finished a revision, known as the Alberton cut-off, of its main line between Hollofield, Md., and Davis, on the old main line between Relay, Md., and Washington Junction. This is part of the work which has been going on for the past seven years making a low-grade freight line between these two points. Relay is the junction point for Washington coming

removed with the shovel. The rest of the excavation was all Maryland granite and was removed with steam drills and shovel.

Dorsey tunnel, one mile west of Alberton and on the opposite side of the river from the old line, is 1,025 ft. long from face to face of portals. This was bored through solid granite. Only 96 ft. of the west end had to be timbered—this on account of seams in the roof. A top heading 7 ft. x 10 ft. was first driven from both ends; the rest of the material was taken out in two benches. The amount of excavation in this tunnel was 36,500 cu. yds.

Davis tunnel is one-half mile east of Davis on the same side of the river as the old line. The material here to be excavated was a mixture of mica sand, soft granite which disintegrated when exposed to the air, and a hard rock which followed the subgrade closely, at times reaching as high as the wall plate grade, 14 ft. above subgrade. This tunnel was 498 ft. long and had to be timbered for its whole length. Seven segments 12 x 12 were used for the centers and a plum post 3 ft. center to center. Where hard rock was encountered at wall plate grade, the segments rested on wall plates on the rock bench. This tunnel was driven in a different way from the Dorsey tunnel. The first heading was excavated from the roof to the wall plate grade and was taken out full width, the bottom bench being taken out later. The excavation in the Davis tunnel amounted to 17,000 cu. yds.

On October 22, 1906, while this tunnel was being lined, after 96 ft. of lining had been finished in the east end, a fall 30 ft. in diameter occurred 140 ft. from the east end, almost on the center line and extending to the original surface of the ground, 92 ft. above subgrade. This fall was almost plumb and looked like a shaft. The north side overhung slightly and had a well defined rock seam. From that point south the material was soft granite and mica sand. The contractor then began to line the tunnel from the west end and finally got to within 104 ft. of the lining from the east end. It was then several times attempted to get under the fall by using crown bars. Four different times the men were within a few feet of getting through when the southwest corner gave way and crushed.



Plan and Profile of Main Line Improvement Between Hollofield, Maryland, and Davis; Baltimore & Ohio.

from the east, and Washington Junction the junction point coming from the west. The through passenger trains run via Washington. The old main line between these two points is being made into a low-grade freight line.

The eastern part of this line from Relay to Mt. Airy follows the Patapsco river, the valley of which is narrow and crooked, with hills rising from the water's edge and spurs from these hills projecting across the bends of the river. The original main line, which had heavy grades and curves, followed closely the windings of the stream. In the reconstruction the line has been straightened and a number of tunnels and bridges have been built. The accompanying plan and profile of the territory between a point west of Hollofield and Davis shows the old and the new lines.

Work was begun on this section in September, 1905, and completed in October, 1907, during which time 400,000 cu. yds. of material were excavated. Seventy per cent. of this was granite; the rest sand, loam and clay. There were 10,000 cu. yds. of Pennsylvania sand stone bridge masonry built and 5,000 cu. yds. of concrete in foundations. Two tunnels, together 1,523 ft. long, and three undergrade crossings were built. Two changes of the river channel were made and a highway nearly a mile long was reconstructed.

The grading averaged 100,000 cu. yds. to the mile. In the cut west of Alberton, which is 2,000 ft. long and 75 ft. high, there were 187,000 cu. yds. of grading. Nearly all the earth on the entire contract was in this cut between the original surface and a point about 25 ft. above subgrade. All the material in this cut was removed with a 70-ton Bucyrus shovel working in lifts from surface to subgrade, bringing it down full width and wasting the top material on tracks running around the contours of the hill on the same grade as the shovel.

The material in the east end of the south side of this cut was made up of pockets of mica sand, red clay and ledges of limestone alternating. This formation caused the south slope to break and pockets of this material to slide out at the seams. These slips were

the timber centers. This method was then given up. By June, 1907, the sides of the fall had been increased to 53 ft. at the roof of the tunnel and 140 ft. at the surface of the ground. A model A. Marion shovel was then put on the work and this removed the fall, which contained 36,000 cu. yds. and formed a natural slope to the original grade. The Davis tunnel was finished on September 25, 1907.

Both tunnels are standard double-track section lined with shale and vitrified brick and have sandstone portals. They were both driven by compressed air, the compressor plant being midway between them and connected with them by 4-in. pipes. Payment for this work was not made per unit of excavation classified but at a price per lineal foot of finished tunnel.

The bridge crossing the Patapsco river at Alberton has five spans: One 27½ ft. span; one 2 ft. 9 in. deck girder, forming an undergrade crossing; two 90-ft. spans; one 100-ft. span, and one 70-ft. span. The deck girders are 10½ ft. from base of rail to bridge seat and 32 ft. to the surface of the river. The bridge crossing the river east of Davis has three spans: One 98-ft. span and two 90-ft. deck girder spans 12 ft. from base of rail to bridge seat and 36 ft. to the water in the river. The superstructure of these bridges was furnished by the Pennsylvania Steel Company and erected by the Youngstown Construction Company.

Except for one-half mile west of Hollofield, which was raised 5 ft. above the old grade, the old line was abandoned. East of Alberton the new line was built south of the old line through a rock cut. From Alberton to just east of Davis tunnel the new line is on the opposite side of the river from the old line. At the east end of Davis tunnel the new line crosses the river and the old line at a point 12 ft. above the old grade and at the west end of the tunnel crosses the old line again at a point 8 ft. above the old grade. It continues on the north side of the old line to Davis where it connects with the old line.

The change of line does away with 542 deg. of central angle of

curvature, reduces the maximum curvature from 12 to 7 deg., the westbound grade from 0.9 to 0.5 per cent., and the eastbound grade from 0.8 to 0.5 per cent. On the new line all curves are spiraled and all grades compensated. The new line is double track laid with stone ballast and 85-lb. rail with a roadbed 39 ft. wide in cuts and 33 ft. wide on fills.

The cost of this change of line was \$750,000. T. A. Shoemaker & Company, of Philadelphia, were the contractors and the work was done under the direction of D. D. Carothers, Chief Engineer; A. M. Kinsman, Engineer of Construction, and J. T. Wilson, Assistant Engineer of the Baltimore & Ohio.

Car Surpluses and Shortages Jan. 8.

Owing to the general car surplus, Mr. Hale's committee feels that it is unnecessary at present to continue issuing bulletins giving the situation in detail, but will supply it for designated roads upon request. The following condensed bulletin is issued, as of January 8, with totals compared with Dec. 24, 1907:

Group.	Group No.	No. of roads.	Surpluses					Shortages				
			Box.	Flat.	Coal gndls.	All hoppers, others.	Total.	Box.	Flat.	Coal gndls.	All hoppers, others.	Total.
New England	1	9	1,859	2,327	450	117	4,953	52	0	6	1	59
N. Y., N. J., Del., Md., and Eastern Penn.	2	19	31,029	1,377	38,244	10,401	81,051	279	3	25	14	321
Ohio, Ind., Mich., Western Penn.	3	21	28,287	5,305	53,720	8,186	95,498	0	0	0	12	12
Va., W. Va., N. C. and S. C.	4	11	6,443	1,605	5,527	1,896	15,471	0	0	0	0	0
Ky., Tenn., Miss., Ala., Ga. and Fla.	5	19	6,515	1,140	4,386	1,570	13,611	0	0	0	0	0
Iowa, Ill., Wis., Minn., N. Dak.	6	25	37,650	2,398	15,387	7,732	63,167	42	22	0	16	80
Mont., Wyo., Neb., S. Dak.	7	4	2,401	221	1,171	1,138	4,931	0	0	0	0	0
Mo., Ark., Kan., Colo., etc.	8	17	9,740	1,103	4,780	2,623	18,246	84	1	0	55	140
Texas and Louisiana	9	8	1,957	150	86	106	2,299	0	0	5	20	25
Ore., Idaho, Cal., Nev. and Ariz.	10	15	5,528	3,479	865	2,614	12,486	0	0	0	0	0
Canadian Group	..	6	8,395	1,885	171	1,734	12,185	0	50	136	17	203
Grand total	..	154	139,804	21,190	124,787	38,117	323,898	457	26	36	118	637
December 24th, 1907.	..	153	87,714	14,740	62,150	42,276	206,880	187	81	191	265	724

Improvements Ordered by Texas Railroad Commission.

The Railroad Commission of Texas, after inspection of the lines, has issued orders to the Texas & Pacific, the International & Great Northern, the Fort Worth & Denver City, and the Chicago, Rock Island & Gulf to make improvements. The orders to the first three of these roads fix minimum schedules for passenger trains over the lines which are to be improved. These schedules are to remain in effect until the improvements have been made and the schedule time can be shortened, subject to the Commission's approval.

The improvement orders to the Texas & Pacific do not cover the El Paso division, which had not yet been inspected when the orders were issued, but on which improvements are to be ordered later. The improvements required of the Texas & Pacific are as follows:

To relay with rails, not lighter than 75 lbs. per yard, all remaining 56-lb. rails in the Transcontinental division between Bagwells and Sherman, 82 miles. To be completed by December 31, 1908.

To renew all decayed and unserviceable ties now in the track over the entire mileage of the Eastern and Transcontinental division and the joint track between Whitesboro and Fort Worth, with an average equivalent to about 15 per cent. of all ties now in the track, or between 500 and 600 per mile. To begin at once and be completed by June 30, 1908.

To ballast with broken stone, or first-class gravel ballast, averaging from 2,500 to 3,000 cu. yds. per mile, the entire mileage of the Eastern and Transcontinental divisions and the joint track between Whitesboro and Fort Worth, except those parts of those divisions which have been ballasted with stone and gravel during the past year. To begin at once and be completed at the rate of not less than 200 miles per year.

To construct new, suitable and adequate passenger depots at Marshall and Honey Grove and to rebuild and improve the present station buildings at Jefferson and Longview Junction. Plans and specifications for the Marshall and Honey Grove depots to be filed with the Commission by January 31, 1908, and the depots to be completed by December 31, 1908.

The following orders to the International & Great Northern do not include the Houston division of that road, which is still to be inspected:

To ballast with broken stone or heavy gravel ballast, using not less than from 2,500 to 3,000 cu. yds. per mile, all the main line from Longview Junction via Palestine to Laredo, except such parts of this line as have been ballasted with an equivalent amount of gravel ballast during the year 1907. To ballast with sand or gravel the Mineola branch, from Troupe to Mineola; the Henderson branch, from Overton to Henderson, and the Georgetown branch, from Round Rock to Georgetown. The work of ballasting the main line and branches to begin at once and continue at the rate of not less than 200 miles per year until completed.

To renew ties on the main line and branches as follows: Between Longview Junction and Palestine, from 600 to 700 ties per mile; between Palestine and Valley Junction, from 800 to 900 ties per mile; between Valley and Austin, from 900 to 1,000 ties per mile; between Austin and San Antonio, from 1,000 to 1,200 ties per mile; between San Antonio and Laredo, from 700 to 800 ties per mile; between Overton and Henderson, from 600 to 700 ties per mile; between Troupe and Mineola, from 600 to 700 ties per mile; between Round Rock and Georgetown, from 900 to 1,000 ties per mile. These renewals at the designated rates to be placed in track within six months

after the date of this order. All ties placed in these tracks after October 31, 1907, may be credited to the amount required.

To replace with rails not lighter than 75 lbs. to the yard, all 52-lb. and 55-lb. rails now in the main line track between Longview Junction and Laredo and in the Mineola branch between Troupe and Mineola. To be completed by December 31, 1908.

To adopt a schedule looking to the replacement of all wooden bridges with permanent structures of concrete, steel and iron during a period extending not more than five years from January 1, 1908. Replacement of not less than one-fifth of the total amount of wooden bridges now in track to be completed each year.

The Fort Worth & Denver City is commanded as follows:

To carry forward the work of ballasting the entire roadbed between Fort Worth and the Texas state line, using not less than 2,500 to 3,000 cu. yds. of broken stone or heavy sand and gravel ballast per mile. This is to be completed by December 31, 1908.

To renew all decayed and unserviceable ties to the extent of not less than 600 per mile on the average for the entire line within six months after the date of this order. All ties placed in track since December 1, 1907, may be credited.

To construct adequate and suitable depot facilities at Decatur, Electra, Quanah and Amarillo. Plans to be submitted to the commission within 30

days after the date of the order, and depots to be completed by December 31, 1908.

The Chicago, Rock Island & Gulf is ordered:

To construct adequate and suitable depot buildings at Amarillo. Plans for same to be submitted for approval within 30 days after the date of the order, and building to be completed by December 31, 1908.

To renew the ties in track between Amarillo and the Texas-Oklahoma State line near Texola within the next six months, at an average rate of not less than 700 to 800 per mile. All ties placed in the track since December 1, 1907, may be credited.

New Interlocking at Hoboken.

The Delaware, Lackawanna & Western has put in service at its enlarged passenger terminal at Hoboken, opposite New York City, a new electro-pneumatic interlocking plant, a general plan of which is shown in Figs. 8, 9, 10 and 11 herewith. This is a track circuit plan and it does not show the normal position of the switches. Fig. 1 is a general view of the yard, looking east from bridge No. 5. No detector bars are used in this plant, track circuit detector locking being used. A good view of a slip without detector bars is shown in the foreground at Fig. 1. As will be seen from the plan there are two long signal bridges as well as four short ones. The latter are not new, having been put in with the former plant several years ago.

Fig. 4 shows the cabin, which is of brick to the first story and of reinforced concrete above that. The top floor contains the interlocking machine. This is the standard electro-pneumatic machine made by the Union Switch & Signal Co. There are:

- 55 levers for 36 single switches;
- 23 double slip switches with movable point frogs;
- 1 single slip switch with movable point frog.
- 44 levers for 110 signals.
- 59 working levers;
- 11 spare switch levers;
- 21 spare signal levers;
- 131 = lever frame.

Fig. 5 shows the machine. In this machine there are light indicators, showing whether or not a track is occupied, one under each switch lever. These consist of ground glass disks about 2 in. in diameter, but they do not show in the illustration. They are fixed in the ledge beneath the levers, each indicator directly under the switch for which it indicates. The number of the indicator is painted on its face. The machine was found to be too narrow to accommodate all the necessary contacts on the usual horizontal rollers. To overcome this difficulty vertical rollers were added at the back side.

The train director has before him a cabinet containing 14 miniature semaphore indicators to indicate whether or not the train shed tracks are occupied (Fig. 7). There is another cabinet containing 14 disk indicators controlled from push buttons fixed in the train shed at the east and the west ends on each track. These buttons are used to announce that the trains are ready to leave. The row of



Fig. 1—General View of Hoboken Yard Looking East from Signal Bridge No. 5.

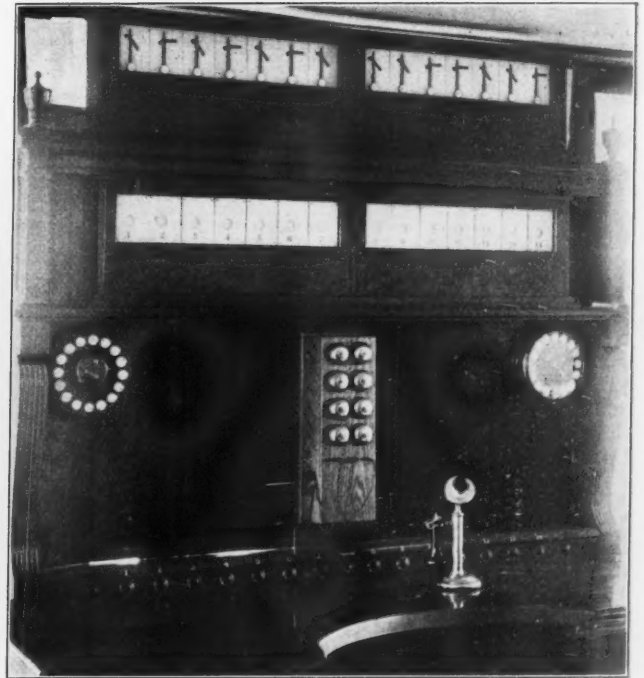


Fig. 7—Train-Director's Desk in Cabin.

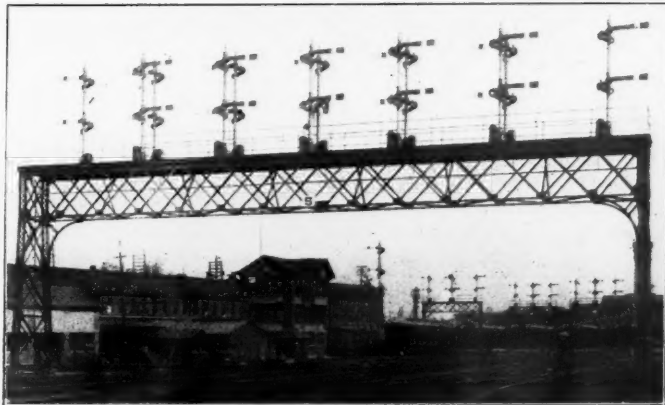


Fig. 2—Signal Bridge No. 5.



Fig. 4—Brick and Concrete Signal Cabin.

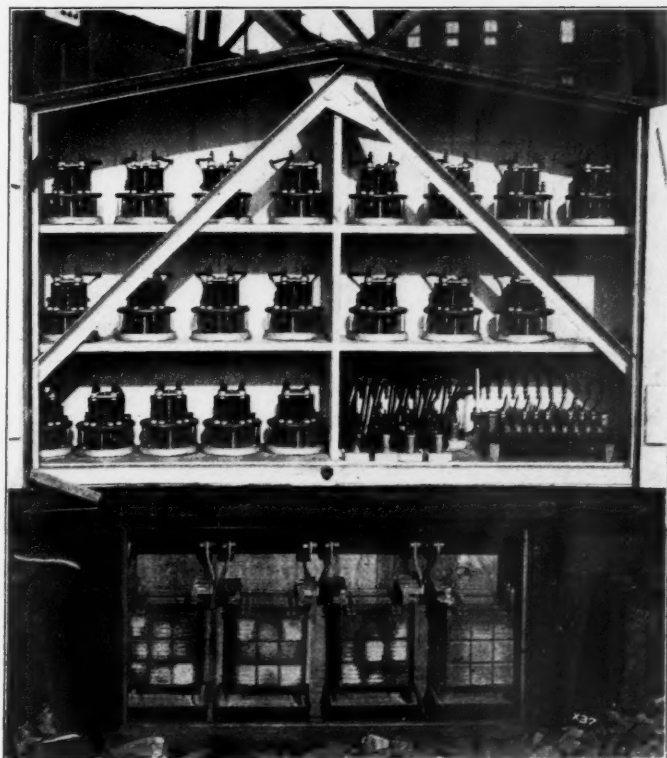


Fig. 3—Battery Cupboard at Signal Bridge No. 5.

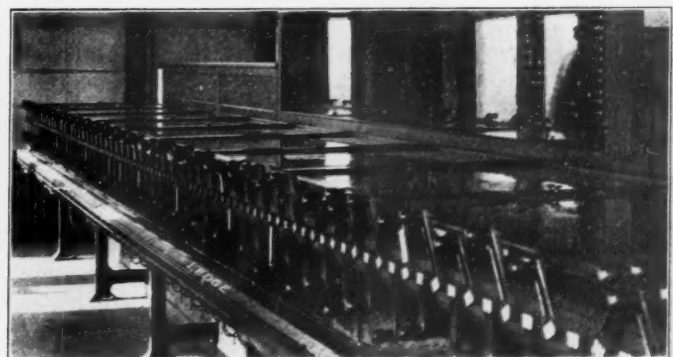


Fig. 5—Electro-pneumatic Interlocking Machine.

Electro-Pneumatic Interlocking Switch and Signal Apparatus at Hoboken, N. J.—Delaware, Lackawanna, & Western.

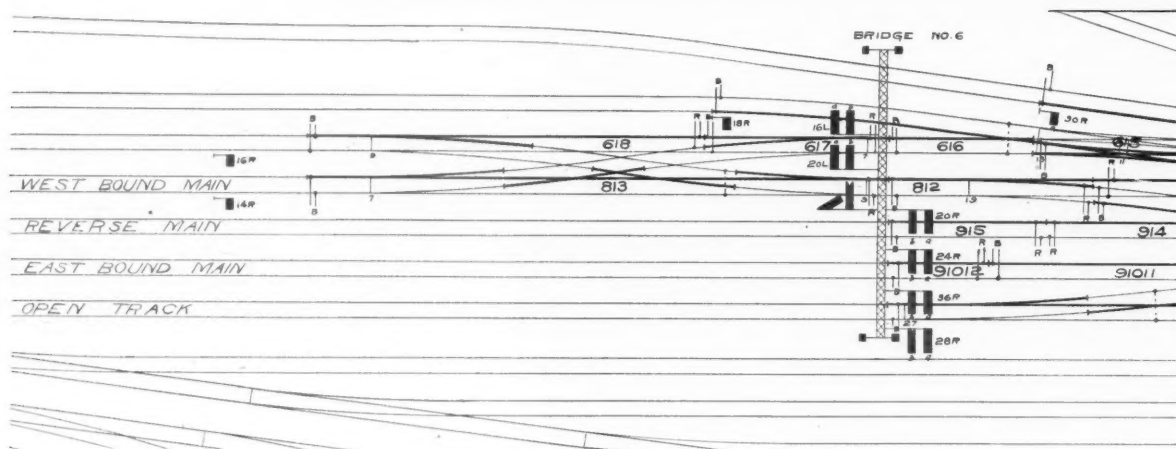


Fig. 8.

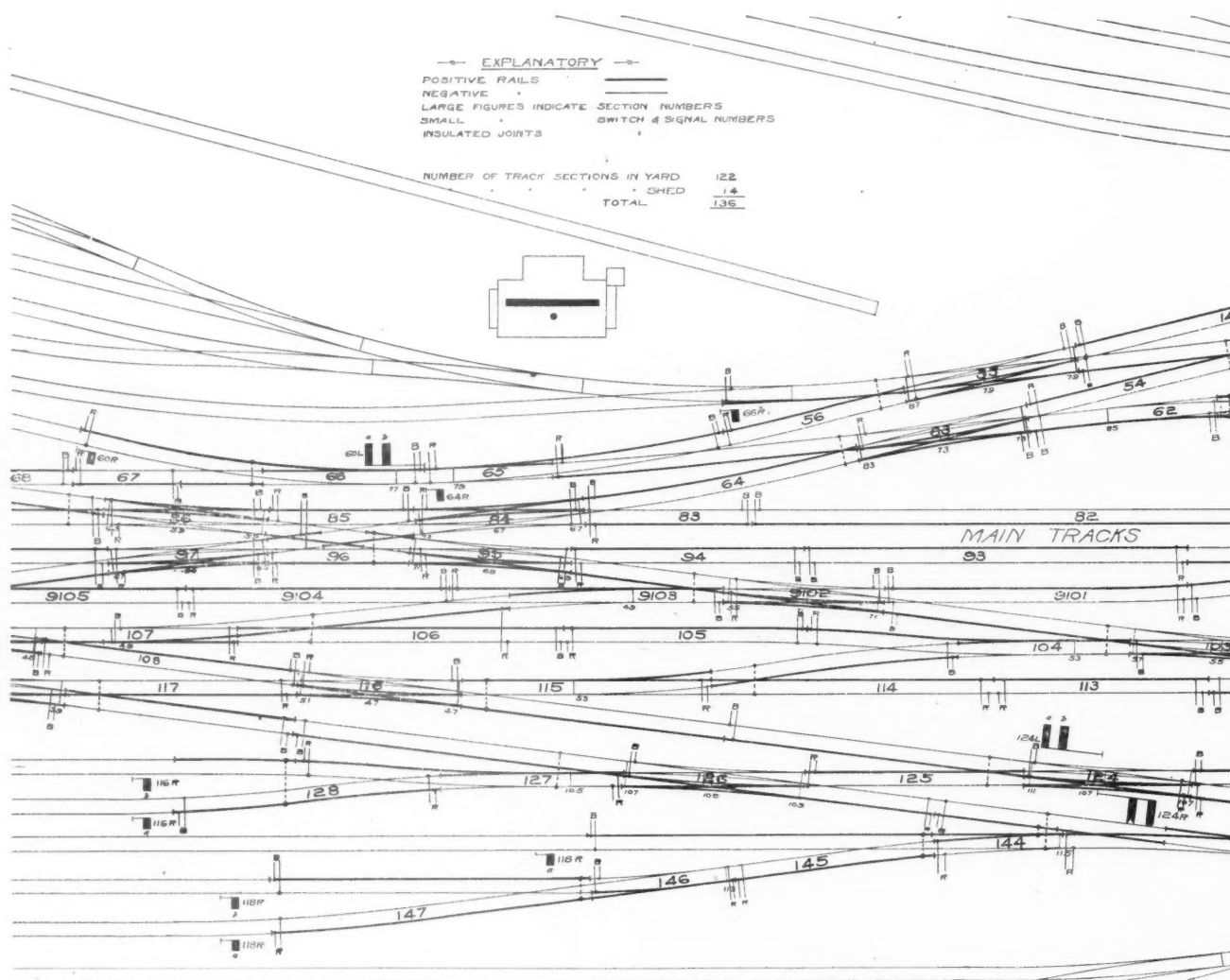


Fig. 10.

Figs. 8, 9, 10 and 11—Plan of Tracks at Passenger Terminus of the Delaware, Lackawanna & Western, Hoboken, N. J.

Note.—To follow a given track from west to east through the yard, read the drawings in the order of their numbers—8, 9, 10 and 11.

push buttons shown in the illustration are for restoring the disk indicators to their normal position.

The middle floor of the cabin contains the relay room, supervisor's office, yardmaster's office, and toilet. In the relay room are 122 repeating relays and 70 route-locking relays, making a total of 192 relays. They have six points each and are of 1,000 ohms resistance.

The lower floor is used for a repair shop and a generator and battery room. The generator room contains a G. E. 5-h.p. 440-volt, 3-phase, 60-cycle induction motor, direct connected to a G. E. 60-volt, 3-k.w. d.c. generator and G. E. 1-h.p. induction motor, same characteristics as above, direct connected to a G. E. 20-volt, 1/2-k.w. d.c. generator. The large set is used to charge the storage batteries, and the small one to furnish current to the interlocking machine in case of emergency. The main switchboard is in this room.

In the storage battery room are two sets, eight cells each, 440-amp. hours, chloride accumulator to supply current to the machine, and two sets, two cells each, of same type to furnish current to the 14 track circuits in the train shed.

Fig. 3 shows a battery cupboard fixed in one of the legs of bridge No. 5. The cupboard contains 19 relays and the resistance used in connection with track circuits. The four storage battery cells in the lower cupboard are for track circuits near this bridge. These cells are 144 amp. hours each. They are General Storage Battery Co.'s 7 E type.

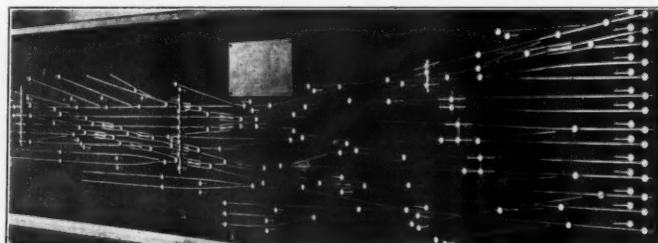


Fig. 6—Track Indicator.

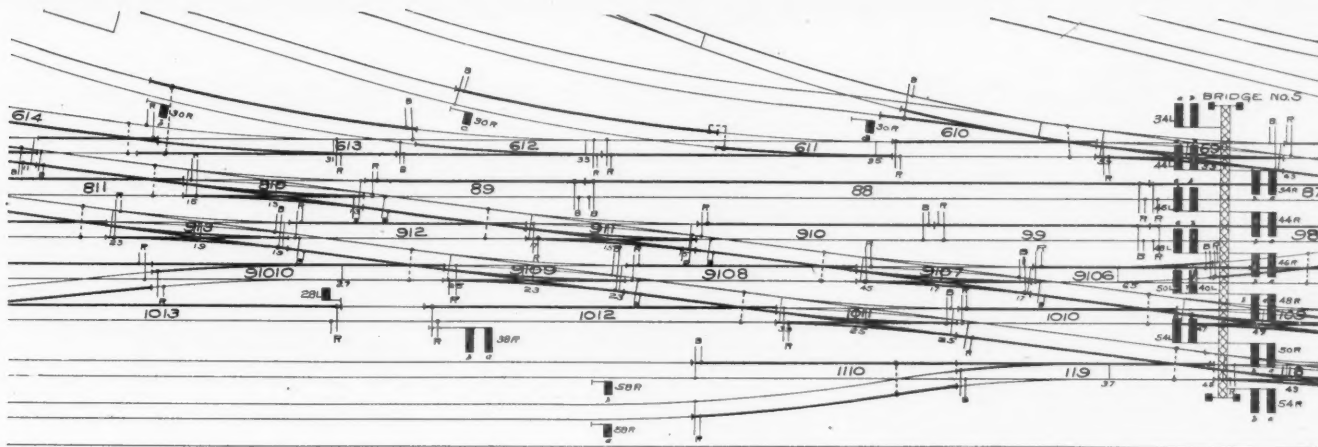


Fig. 9.

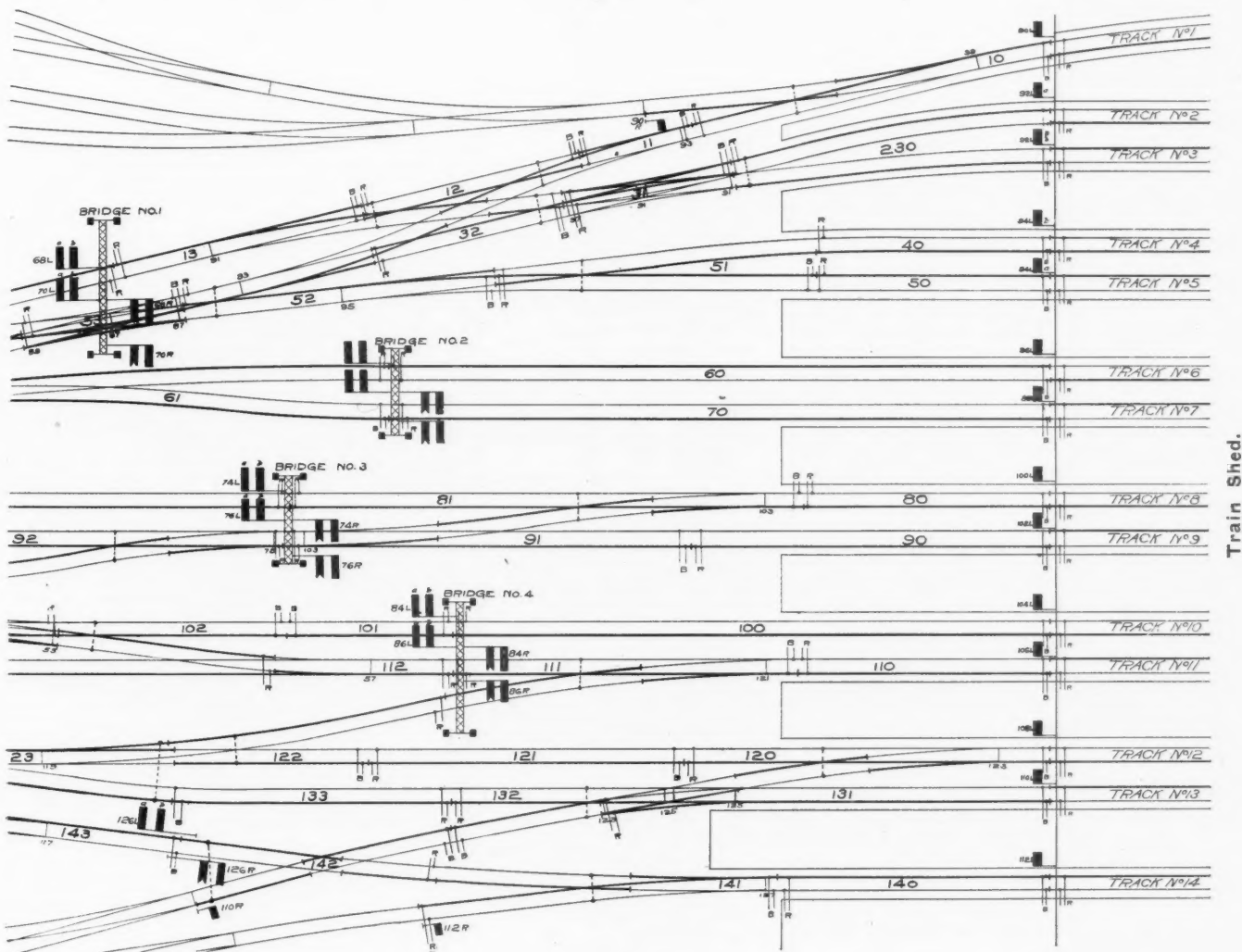


Fig. 11.

Figs. 8, 9, 10 and 11—Plan of Tracks at Passenger Terminus of the Delaware, Lackawanna & Western, Hoboken, N. J.

Note.—To follow a given track from west to east through the yard, read the drawings in the order of their numbers—8, 9, 10 and 11.

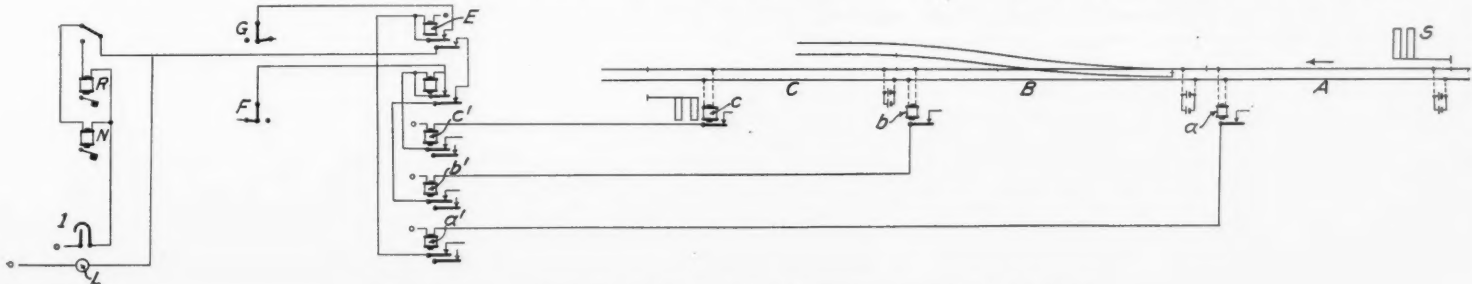


Fig. 12—Typical Electric Locking Circuits for Route Locking.

a', b', c'—Track-repeating relays.
P, G—Signal-lever circuit controller.

One hundred and twenty-two track circuits are fed from storage batteries. The batteries are contained at each signal bridge and in two special boxes opposite the cabin. The track circuits cover all switches, fouling points, and in many cases gaps between a signal and the first switch, and also between switches, to make route locking continuous.

Fig. 12 shows a typical electric locking circuit. The track is divided into convenient sections between signals so as to allow of maximum freedom of lever movement; *a, b, c* are track relays for circuits A, B, C, respectively. Each of these track relays controls a repeating relay, *a', b', c'*. These merely repeat the action of the track relays. Relays *a'* and *c'* control advance stick relays. The

stick circuit is operative only when signal lever is reversed, so that for reverse train movements the circuit will be an ordinary locking circuit. When once this relay has opened, owing to the presence of a train in the section with the signal lever reversed, it cannot pick up again until the train has left the track section; but with the lever normal the relay will be inoperative. This arrangement provides approach locking. Special magnets are provided on the indication quadrants in the machine to prevent the lever from being put full normal or reversed, as the case may be, when the magnet is de-energized. The circuit for these magnets is selected through a circuit controller on the lever and passes through the stick relays or repeating relays for the route governed and to the battery; and to common, through a latch circuit-controller normally open. In parallel with the circuit for these magnets is an electric light placed just below the lever handle, which burns when the switch is free but is extinguished when the switch is locked by the presence of a train.

Thus circuits are provided to lock all switches in the route when a train passes the governing signal at clear. The switches remain locked until the train has passed over them or has backed off the route. Each switch is released as soon as a train has cleared its points or cleared a fouling point. Thus a route cannot be changed ahead of a train, but may be behind one provided the home signal has been put normal.

All control wires are run in bituminous fiber conduit, made by the American Conduit Co. This conduit is laid in concrete with manholes at distributing or junction points about every 100 ft. Large main conduits run each way from the cabin.

The distant signals governing movements into the train shed are used to indicate whether or not the shed tracks are occupied. If a train is already on the shed track the distant cannot be cleared.

This plant was installed by the railroad company's men under the direction of M. E. Smith, Signal Engineer. The material, except as otherwise noted above, was furnished by the Union Switch & Signal Company. Mr. Smith informs us that the value of the light-indicators (beneath the switch levers) as an aid to quick movement in case of dense fog, when the levermen can see but a short distance from the cabin, has already been tested, with highly satisfactory results.

Right to Discharge a Union Man Upheld by the United States Supreme Court.

The United States Supreme Court (opinion by Justice Harlan) on Jan. 27 decided that the most important section (10) of the arbitration act passed in 1898 is unconstitutional. Justice McKenna and Justice Holmes delivered dissenting opinions. The case was that of William Adair v. United States. Mr. Adair, who was and now is Master Mechanic of the Louisville & Nashville, at Covington, Ky., was tried in the United States District Court on the charge of threatening to discharge a locomotive engineer named Coppage, because he was a member of a labor union. Under the act of 1898, which was passed as one of the results of the great Chicago railroad strike, the District Court fined Adair \$100. The decision of the Supreme Court overthrows this verdict.

In the course of his opinion Justice Harlan said:

"The right of a person to sell his labor upon such terms as he deems proper is in its essence the same as the right of the purchaser of labor to prescribe the conditions on which he will accept such labor from the persons offering to sell it. So the right of an employee to quit the service of the employer, for whatever reason, is the same as the right of the employer, for whatever reason, to dispense with the services of such employee. It was the legal right of the defendant, Adair, however unwise such a course might have been, to discharge Coppage because of his being a member of a labor organization, as it was the legal right of Coppage, if he saw fit to do so, however unwise such a course on his part might have been, to quit the service in which he was engaged because the defendant employed those who were not members of some labor organization. In all such particulars the employee and the employer have

equality of right, and any legislation that disturbs that equality is an arbitrary interference with the liberty of contract which no government can legally justify in a free land.

To Provide for a Uniform Balance Sheet.

The Interstate Commerce Commission has sent out a circular asking the criticisms, suggestions and assistance of railroad officers in drawing up a uniform balance sheet. For purposes of the study the suggestion is made that the assets and liabilities of carriers should be divided into three general or primary accounts: (1) capital, (2) deferred and miscellaneous, (3) current or working. These general or primary accounts it is proposed to subdivide into such detail or subprimary accounts as may be found necessary to reflect sufficient data to enable clear and comprehensive analysis. The Commission asks the following questions and submits the following tentative balance sheet, with the request that replies to the circular should be made in duplicate, one copy to be sent to C. G. Phillips, Secretary, Association of American Railway Accounting Officers, 143 Dearborn street, Chicago, and one copy to the Division of Statistics and Accounts, Interstate Commerce Commission, Washington, D. C. Replies should be sent prior to March 1.

1. To produce uniformity in compilations, subprimary accounts should be classified and a prescribed classification thereof agreed upon. You are therefore requested to submit for consideration a classification representing your views as to what items appearing on your general ledger should appear under the three general accounts suggested, and the order in which they should appear.

2. Generally speaking, "Cost of Road," "Cost of Equipment," and "Cost of Property" other than road and equipment, as reflected in the balance sheet, are those costs only which are capitalized, and do not include additions made to either of the classes mentioned from surplus or income; as a result, those accounts do not reflect true costs. If additions are made and charged to income, they disappear through the profit and loss account. To the end that the balance sheet may reflect the true costs of the property of a carrier, should not the costs of additions made and charged to income or to surplus be shown on the balance sheet as separate and distinct items?

3. Should the cost of equipment as stated on the balance sheet be affected by the introduction of the depreciation charge; that is, should that cost be the original cost, or the inventory value at a given date, or should it be the original cost or the inventory value as reduced periodically to the extent of the depreciation charge? You are requested to consider these three methods of procedure, and to state which of them approves itself to your judgment, giving your reasons therefor. In considering this question, due regard should be had to the possibility of introducing depreciation charges for other classes of railroad property than equipment.

4. The disposition through the balance sheet of premiums and discounts on securities sold, when securities are sold for the purpose of recouping a corporation for additions to its property, or for the construction or acquisition of new property, should be carefully considered. Should premiums and discounts be disposed of through "income," "profit and loss," or "cost of property," or should they be set up in a permanent capital account on the balance sheet? You are requested to submit definite suggestions relative thereto, and your reasons therefor.

5. In stating capital liabilities, what distinction upon the balance sheet between "authorized issue," "outstanding," and "held in the treasury," should be made, it being understood that these terms are used in connection with an analytical statement of balance sheet liabilities?

6. Should material and supplies on hand be treated as a capital or a current asset and your reasons therefor? Many other questions will present themselves when the balance sheet is taken into final consideration. You are therefore requested to submit whatever observations and statements of facts, in your opinion, will be of assistance in working out the problem here submitted.

Previous year.	ASSETS	Current year.	Previous year.	LIABILITIES.	Current year.
Capitalized:			Capital:		
Cost of road			Common stock		
Cost of equipment			Preferred stock		
Cost of other property			— stock		
Cost of securities			Funded debt		
Total capitalized assets					
Additions through income:			Miscellaneous unfunded		
Roadway			Capital liabilities of leasehold		
Equipment			properties		
Other property					
Securities					
Total additions through income					
Leasehold properties					
Total capital assets					
Deferred and miscellaneous:			Total capital liabilities		
Current or working:			Deferred and miscellaneous:		
Profit and loss			Current or working:		
			Profit and loss		
Grand total			Grand total		

Tentative Balance Sheet.

The Shelling Out of Steel Wheels and Tires.*

BY GEO. L. FOWLER.

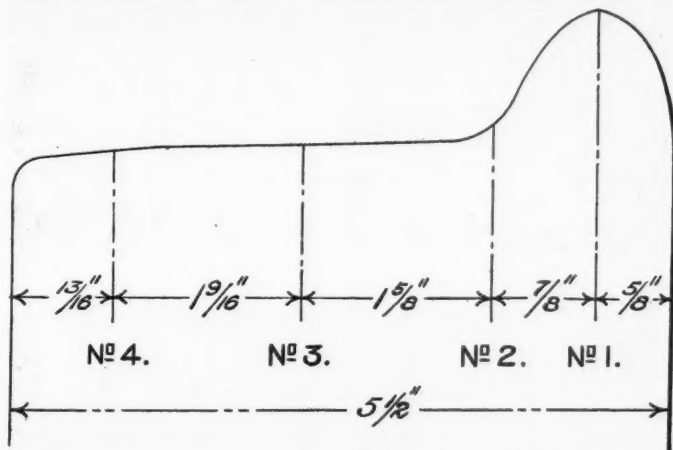
The service that can be expected from any wheel depends on the soundness and homogeneity of the metal of which it is composed. Irregularity of texture must necessarily result in irregular wear, while local defects are apt to result in an immediate failure. Of such failures, one that is the cause of much annoyance and trouble is that known as shelling out. It was for the purpose of ascertaining, if possible, the causes of this shelling out of wheels and tires that an examination with the microscope of a number of defective tires that had failed in service was undertaken.

The Rules of Interchange of the Master Car Builders' Association define a shelled-out wheel as one "with a defective tread on account of pieces shelling out." This is a poor definition; it may be supplemented by saying that the common understanding of a shelled-out wheel is one in which pieces from the tread have flaked off, due to inherent defects in the metal, such as the laminations so frequently found in wrought-iron boiler plates. It will be seen later that the analogy in the case of steel wheels is very close. The cause of shelling out of cast-iron wheels is outside of this investigation and will not be considered.



The samples of defective material investigated include one of each brand of wheel and tire previously referred to in these pages, and were obtained from several railroad companies. Each of these wheels and tires had one or more shelled-out spots on the tread, and there were also places on each where no signs of shelling out could be detected. The general appearance of two samples is shown in the accompanying photographs, and these may be considered as characteristic of all.

A section was taken at the spot where the worst shelling was found and another through a place on the tread where the metal showed no external signs of deterioration. These sections were



Section of Tire, Showing Location of Microphotographs.

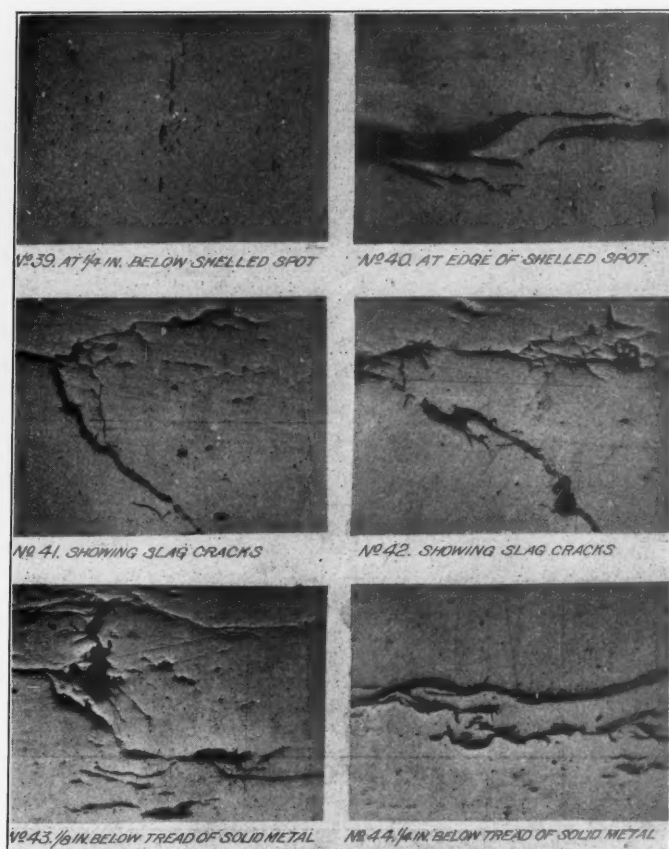
then cut into strips whose centers lay along the lines 1, 2, 3 and 4 respectively. The strips were then polished, etched and photographed. The photographs were taken at the tread, and at intervals approximately $\frac{1}{8}$ in., $\frac{1}{4}$ in., $\frac{3}{8}$ in. and $\frac{1}{2}$ in. below. This was

not strictly followed in all cases, since the examination was governed, to a certain extent, by the structure of the material examined, as it appeared under the microscope.

Nos. 39 to 42 show the structure of the C tire at the point where the worst shelling out occurred. In strip No. 1, which ran down into the wheel from the flange, the metal shows a fairly good fine-grained structure at the edge and well down into the rim. In No. 39, which was taken at $\frac{1}{4}$ in. below the edge, spots of manganese bisulphide are visible. The metal shows a good structure in all of the strips down to $\frac{1}{2}$ in. in depth, wherever the photographs avoid the serious defects. In No. 40, however, which was taken from strip No. 3, there is a distinct flaw due to the presence of slag. The same kind of flaw appears, very pronounced, in the photographs Nos. 41 and 42, which were taken from strips Nos. 2 and 3 respectively, and through which a continuous line of slag extends. At other points adjacent to these defective places normal conditions and structure of metal was found.

Photographs Nos. 43 and 44 were taken from points on strip No. 3 at depths of $\frac{1}{8}$ in. and $\frac{1}{4}$ in., cut from an apparently solid piece of metal, and yet they show the presence of pronounced slag flaws. These flaws had not developed into shelled-out spots, but it is reasonable to suppose that it was only a matter of time when they would have done so.

Comparing this defective C tire with the sound new tire, the



Microphotographs of Shelled-Out C Tire.

absence of a decarbonized surface on the defective tire is to be noticed, while it was very apparent in the new tire and can be clearly seen in photograph No. 7 (*Railroad Gazette*, Jan. 24). This is accounted for by the fact that the defective tire was in service and this soft outer shell had been worn away.

The balance of the material of the defective C tire is normal in structure, except that the manganese sulphide globules are large. Its failure is readily accounted for by the slag flaws found scattered through the whole body of the material as shown in Nos. 40 to 44.

The B tire failed from the same cause as the C tire. The structure of the metal is normal through a large part of the sections, but contains occasional slag cracks, and the characteristic markings of manganese bisulphide, as shown in No. 45. In the other parts of the tire precisely the same conditions exist as in C tire, namely, slag cracks, as shown in Nos. 46, 47 and 48, which were taken at various depths, and where no indication of shelling out had appeared at the time that the tire was removed from service. The presence of such large slag veins as those shown in Nos. 46 and 47 leaves no room for doubt as to the cause of failure. The presence of manganese bisulphide was also indicated in the new Tire B, but no slag veins are revealed.

Nos. 49 and 50 were taken from the defective A tire. If the metal of this tire is compared with that of the sound new tire, it will be seen that there is no variation in the normal structure

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of the material to indicate a difference in the wearing quality, so that the failure of the shelled-out tire is undoubtedly due to the slag flaws clearly shown in the photographs.

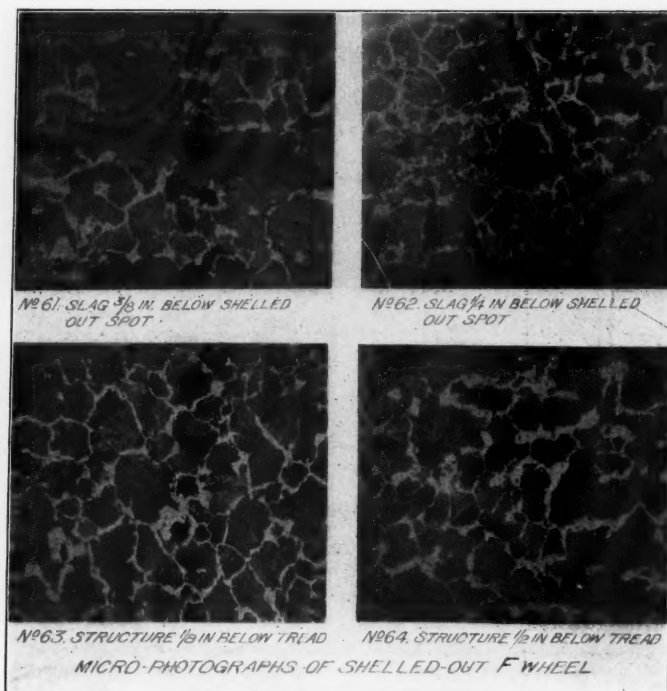
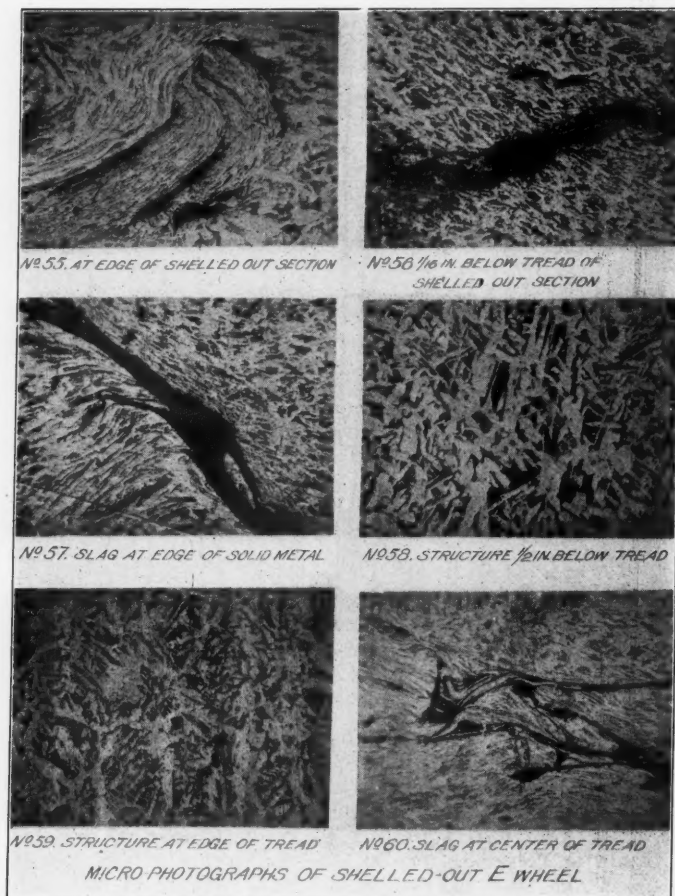
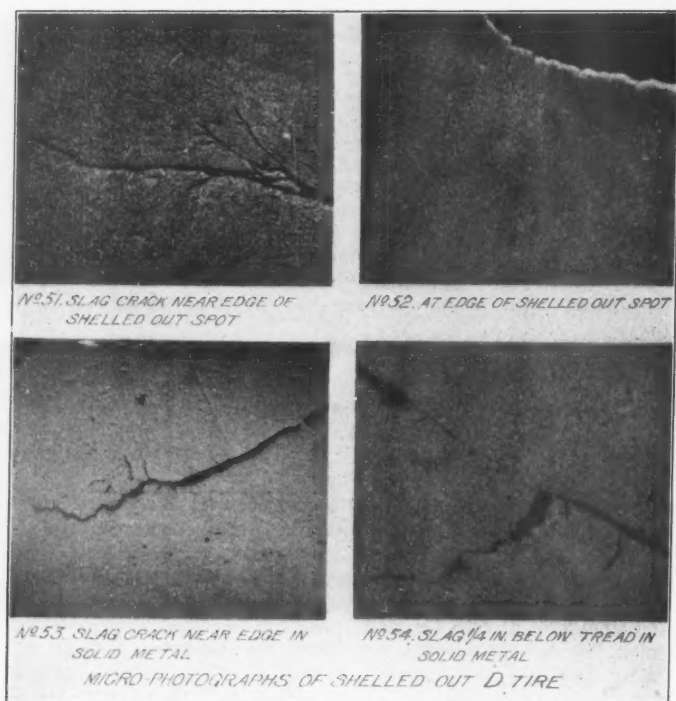
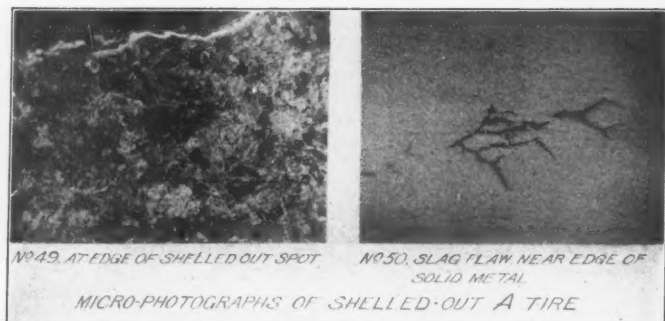
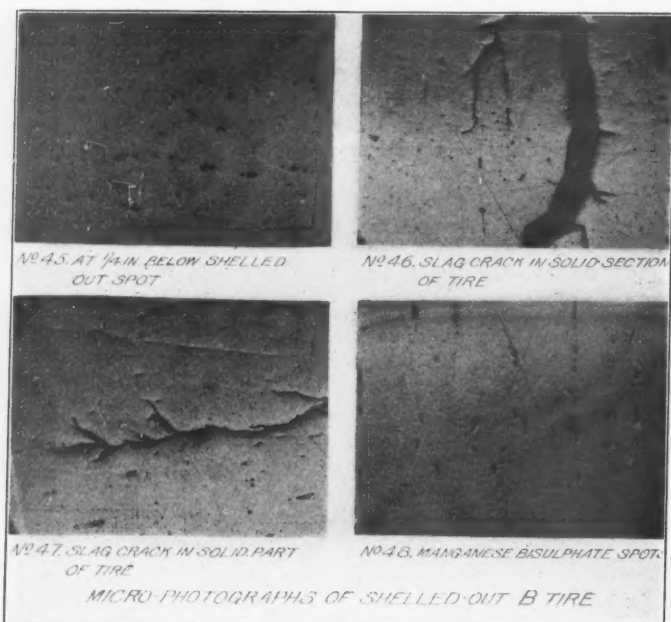
In the shelled-out D tire normal structure was found but interspersed with slag cracks as in the other defective tires. These are shown in Nos. 51 to 54, some of which were taken close to the edge of the tread. In some places there were spots of manganese bisulphide near the edges, but the cause for failure is the presence of the slag flaws that form planes of extreme weakness. In photograph No. 51 such a flaw is shown, which eventually must have caused shelling out. Another example of the same sort is shown in No. 52.

In the E wheel, the slag flaws can be seen in Nos. 55 and 56,

which were taken from the shelled-out portion. In No. 55, there is a distortion of the slag defects due to the forging and in No. 57 there can be seen a slag crack which existed in the metal with no visible defect on the surface.

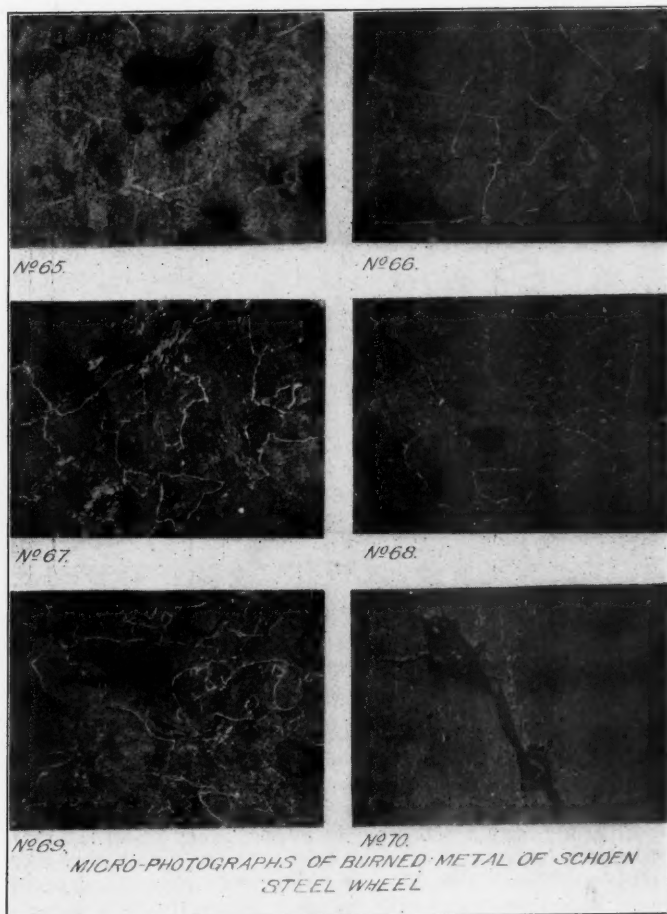
The material in this particular wheel is bad in every particular. The carbon content is low, apparently ranging from 0.35 to 0.40 per cent. The effect of both the work and heat treatment is practically *nil* and the structure looks like that of untreated cast steel or a metal that has been overheated. The surface shows the effect of cold rolling in the mixture of ferrite and slag, the whole having a schistose appearance. The presence of so much slag, as shown in Nos. 55, 56 and 57, renders the wheel totally unfit for service. The grain is coarse, as is seen in photos Nos. 58 and 59, and resembles that in the new wheel of the same brand that was examined. The carbon content of the new wheel, however, was apparently much higher.

In the shelled-out portion of the F wheel the slag flaws also appear well down in the metal, see Nos. 61 and 62. What was

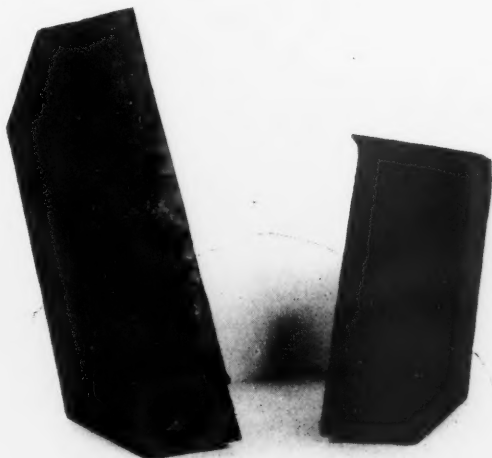


said of the defective E wheel applies to the F wheel. The carbon content seems to be low, while the presence of large quantities of slag, photograph No. 67, caused the many lines of weakness along which rupture occurred.

At the time this examination was being made, three specimens



of the Schoen solid forged and rolled steel wheel were obtained, two from shelled-out wheels and one from a section of a wheel



Burned Metal of Schoen Steel Wheel.

that had been purposely burned in heating during manufacture. An examination of the photographs of the two defective wheels, Nos. 67 to 70, shows that there are defects in the interior of the metal that were undoubtedly the cause of the shelling out but there is no evidence of slag. The same characteristics are to be noted in Nos. 65 and 66 of the specimen that had been purposely burned. The three specimens are examples of burned steel in which there is no evidence of slag.

From these photographs it is evident, therefore, that the cause of the failure of all of the wheels and tires, except the Schoen wheels, was due to the presence of slag flaws occurring near the surface of the tread.

It appears, therefore that there are at least two causes for the shelling out of steel tires and wheels, namely, slag flaws and over-heating.

Western Canada and the Canadian Northern Railway.*

The commercial history of Western Canada begins in 1670, with the charter by which Charles the Second constituted Prince Rupert and seventeen of his friends—"The Governor and Company of Adventurers Trading into Hudson's Bay"—and permitted them to trade over an area of 2,500,000 square miles. For these tremendous privileges their only obligation to the monarch was to supply him annually with two elk and two black beaver from the country over which they assumed practically sovereign rights. The difference between the elk and beaver of the Governor and Company of Adventurers and the annual reports of the Canadian Pacific Railway and the Canadian Northern Railway is the difference between Western Canada without transportation and Western Canada with transportation.

One of the most remarkable characteristics of the race to which we belong is the pioneering instinct. It has made us what we are. Why do men carry implements and wives into the far country of the Peace river when a thousand miles nearer the best market for their produce, there are square miles of fertile land to be obtained for the asking? A gentleman, whom I will not name, was asked if he would sell, at a magnificent profit, his interests in a railroad system. His answer was, "No, I like building railroads." Now, the instinct of the Peace river agriculturist is vitally the same as that of the railroad projector. Each is the complement of the other, and each contributes to the newness of life that comes to the migrating millions of the race without which no empire can save itself alive. The impulse that brings my fellow-countrymen to Canada is not always the desire to acquire a little money. It is rather the reassertion of that elemental quality in virile mankind which has founded colonies and transplanted empires across the face of the planet. Abraham trekked out of Ur of the Chaldees under Divine direction. Thousands of settlers in the Canadian west were moved by the same influence, though they didn't recognize it, in the lantern lectures of the agents of the Dominion Government or the advertisements of steamship and railroad companies.

It is a profitable exercise occasionally to dip into the earlier literature of the prairie provinces of to-day. To glance over the prophecy of a living general in the British army, Sir William Butler, in "The Great Lone Land," written in 1871, as you cross Manitoba, Saskatchewan and Alberta in a luxurious train, is to make one fairly well satisfied with what has been done. Butler trailed from Fort Garry to Edmonton and Macleod, and returned over Saskatchewan ice. Reading his book you breathe an atmosphere of isolation, not to say desolation. But in the middle of it there is the prediction of settlement and abounding grain fields, a prediction fulfilled in his own time. Butler's journey was made just 200 years after the charter of the Company of Adventurers was granted. The intervening years had seen the company's work spread over a vast, immeasurable territory, and had produced Lord Selkirk's heroic efforts to found an agricultural community, imported via Hudson's bay to the Red river. But there was a majestic vacancy about the whole land. Even when a corner of the country had become sufficiently civilized to need an armed force to dissipate political rebellion the white population was pitifully sparse. The advance guard of ploughmen pioneers from the East soon afterward, however, began to break through the woods and waters of the Dawson route. But there could be no real advance so long as the Red river and the Dawson route governed the going out and coming in of the people. Men eagerly looked for railroads. They got the railroads, but they have never had enough of them, and never will have so long as there is a railroad builder in whom the pioneering instinct expresses itself in parallel lines of steel and in reduced passenger and freight rates.

The Canadian Pacific was the forerunner. The early promoters of that great corporation have never, I think, received all the credit due for their marvelous and successful effort to bind the East with the West. Remember the conditions under which that great enterprise was accomplished. Between settled Ontario and the prairies there was a wilderness of poverty. Between the prairies and the Pacific were ranges of mountains which many people thought no combination of engineer and capitalist could penetrate. The end-all of the scheme was foreseen by some excellent men to be unpaid bills for axle grease. Financially, the times were unpropitious. In 1879 Sir Sanford Fleming felt compelled, in view of what he considerably called "the necessities of the situation," to advise the Minister of Public Works to "establish a great territorial road on the site of the main line of the Pacific Railway from Lake Nipissing to the north side of Lake Superior."

When, in 1881, the first Canadian Pacific rails were laid west of Winnipeg, the white population between the western boundary of Ontario and the Rocky mountains, and between the United States boundary and the Arctic Circle was 66,161. Manitoba contained 59,187 whites, of whom 8,000 were in Winnipeg, and several thou-

*From an address by D. B. Hanna, Third Vice-President of the Canadian Northern and President of the Canadian Northern Quebec and the Quebec & Lake St. John, before the Empire Club of Toronto.

sands were brought in by the railroad contractors. The true population indicator of that time is the fact that in the Northwest Territories there were only 6,974 whites, practically all living on the fur trade, and 49,500 Indians. It was only in 1876 that civil government was organized in the territories. Governor Laird, who took up his abode at the new-founded Battleford, and who still lives in Winnipeg, has described the perilous conditions under which he journeyed officially to Fort Macleod, which is now in the fall wheat section of southern Alberta. Eliminating British Columbia, then, the Canadian Pacific in 1881 began to open up territory 900 miles long and 300 miles wide—taking the Saskatchewan valley as roughly the northern frontier—with a population of 66,000, or one-fourth of a civilized person to the square mile. But in the territories, or three-fourths of the prairie country, there was only one white person for every 35 square miles of cultivable land. It was not an inviting prospect for men of faint heart and little faith. The Canadian Pacific builders were of another sort. True, the company was given an unprecedented stake in the possibilities of the West, but its early history was one of hard times, and for years was a load of care to those who had riveted to it all of their own fortunes and as much of the fortunes of other people as they could attract to their cause. That it is to-day an enterprise of which all Canadians are proud is gratifying alike to the Dominion and to the company.

Beginning with 1881, the year in which the Canadian Pacific laid the first track west of Winnipeg, the growth of white population in 25 years was as follows:

	1881.	1906.
Manitoba	59,187	365,688
Saskatchewan and Alberta.....	6,974	257,763
	185,412
Total	66,161	808,863

This is an increase of over 1,200 per cent. in 25 years. Quite as illuminating as the growth of population are the immigration returns, which show that during the year ended June, 1896, the total immigration to Canada was 16,835, and in the year ended June, 1907, it was 256,000. Yet the twentieth century had come in before the immigration reached 50,000 in a year. In 1901-2 it was 67,379, and in 1902-3, 128,364.

Equally illuminating is the growth in actual settlers located on free lands granted by the Dominion of Canada. Thirty years ago, or in 1877, 845 homestead entries were made, aggregating 135,200 acres (a homestead is 160 acres), but 54 per cent. of the entries were subsequently canceled, the duties required under the Homestead Act not having been complied with, and the land reverted to the Government. Five years later, in 1882, when the railroad reached Brandon, the homestead entries were 7,483, representing 1,197,280 acres, with cancellations of 47 per cent. Twenty years later, in 1902, the western country had passed the experimental stage, and the larger movement of settlers was in full swing. Then began what has often been called the American invasion, and that year, in addition to hundreds of thousands of acres of land sold by land companies to actual settlers, 22,215 homestead entries, representing 3,554,400 acres, were made. The figures are as follows:

	Homestead entries.	Average acreage.
1903.....	32,682	5,229,120
1904.....	26,513	4,242,080
1905.....	34,645	5,643,200
1906.....	42,012	6,721,920
1907 (10 months).....	25,305	4,048,800

Up to the end of June, 1907, it may be conservatively estimated that over 30,000,000 acres of land have been granted by the Crown to legitimate settlers in Manitoba, Alberta and Saskatchewan. Add to this acreage sales made by railroad companies and land companies of approximately 20,000,000 acres, and it is not difficult to foresee that the Canadian West must soon become the bread basket for the world. The Surveyor-General of Canada estimates that in Saskatchewan and Alberta alone there is a total land area, after deducting 30,080,000 acres for water, of 324,125,440 acres, of which he says 106,240,000 acres are suitable for growing grain, the remainder being suitable for ranches and mixed farming. The influx of people and the occupation of the land have been coincident with railroad expansion.

The great expansion in immigration in 1902-3 was in a most remarkable degree coincident with the extension of the railroad with which I am associated. The Canadian Northern claims no special credit for the phenomenal increase in immigration; but it cannot dispute the fact that the rapid development of the enterprise opened up a wide and fertile territory and made it possible for the great influx of new settlers to locate on free or cheap lands near to markets and general supplies.

Besides enjoying the privilege, as I do, having been the officer in immediate charge of the operations of this company from the first day a wheel was turned, I am able to speak from a personal knowledge of what has been done. I shall refer exclusively to the lines west of Lake Superior. Ten years ago, in 1897, we operated 100 miles of railroad through a then unsettled country. Traffic was light and train service limited. Our equipment consisted of three locomotives and some 80 cars, all told, a working staff of less than

20 men altogether, and a payroll for the year of less than \$17,000. The gross revenue for the first year was under \$60,000, but it was more than sufficient to pay our debts. During that year we handled 25,700 tons of freight and carried 10,343 passengers. There is nothing particularly impressive in these figures.

To-day, or ten years afterward, we are operating 3,345 miles. We have an equipment of 237 locomotives, 219 passenger cars, including 35 sleeping and dining cars, and about 8,500 freight cars of all kinds. These figures do not include the large number of locomotives and cars ordered and now building. The 20 men of 1897 have become 10,700 in 1907, with a payroll of over \$5,000,000 a year. And these figures do not include the large construction forces which at times run into thousands of men. The gross earnings now amount to over \$10,000,000 a year; the freight handled for the past fiscal year was 1,822,220 tons, and we carried 703,988 passengers. We are accepting freight and passengers for 411 different points west of Port Arthur. If I were dealing with eastern as well as western lines I could tell you that the Canadian Northern has become the second largest railroad in Canada. Only a chastened humility prevents me from enlarging the fact that with 2,990 miles in the West actually in operation, 150 in Ontario, 531 in Quebec, and 431 in Nova Scotia, we have in all 4,059 miles in Canada, whereas the Grand Trunk Railway has in the Dominion 3,829 miles.

To me, however, the most fascinating result of the past ten years of western development is that the Canadian Northern system is responsible for the creation of over 150 town sites, of which at least 125 have been named by our officers and at least 70,000 persons (exclusive of Winnipeg and other large centers) have found homes tributary to this railroad. I think it is reasonable to estimate that at least one-third of the growth of Winnipeg in this century is directly due to the business opened up by the Canadian Northern. Let me repeat, we claim no special credit for that. But even railroad men are not devoid of the instincts of citizenship and may be allowed to reflect without boasting that they have inaugurated communities wherein the institutions of a free, strong and intelligent people may mature.

The railroads which connect Winnipeg with Eastern Canada are western lines, inasmuch as without them the West could not be served. They bind the East to the West and the West to the East as nothing else could. They are the abiding symbol of Canadian nationality, and, as they increase in number, they make the nationality the more abiding also. The lakes are the friend of the West in summer, but steel is its defense against the rigors of winter. The railroads are more vital to the national prosperity than water, for rails can do without the help of navigation, but navigation, of itself, would be helpless against the forces that tend to an identity of interest between the western United States and the western provinces.

The function of railroad transportation in the West, then, is to keep open communication with the East. On purely commercial grounds it is infinitely more important to the East than to the West that it should be so. May we not say that this is true, also, as a matter of sentiment? It is not necessary to argue that the present prosperity of Eastern Canada is the fruit of transportation in the West. It is conceded, on the one hand, that the rural population of Ontario has declined. On the other hand, the manufacturing population of Ontario has enlarged out of all proportion to the increase of Ontario's demand for Ontario-made goods, while the Winnipeg warehouses of eastern manufacturers tell an eloquent story of the origin of modern Canadian growth and pay tribute in the fullest sense to the wisdom of rail connection with the East. For Canadian solidarity there must be more and still more communication to and from the West.

Foreign Railroad Notes.

The railroad in German East Africa from Dar-es-Salaam westward to Mrogoro, 140 miles, was opened for traffic Dec. 16 last. It was begun Feb. 9, 1905. Dar-es-Salaam is in 7 deg. south latitude and just about 200 miles south of Mombasa, the ocean terminus of the British Uganda Railroad. The new railroad crosses the unhealthy lowlands near the coast and reaches the comparatively healthy high country. It is intended eventually to extend the railroad to the south end of Lake Victoria Nyanza, making a line nearly parallel to, but about 200 miles south of, the Uganda Railroad.

Last summer the Hungarian State Railroads conducted a series of tests of the Westinghouse quick-action brake, the results of which were recently published. The tests were made with a train of 71 covered freight cars, with three passenger cars interspersed among them for purposes of observation, and two testing cars equipped with all manner of recording instruments. Preliminary tests were made in which the brakes were applied 275 times, with no injurious shock and no parting of the train. The main tests were then made in the presence of a committee of the German Railroad Union, and of many other Austrian and German railroad officers. The train was hauled first by one and then by two locomotives, and all the applications of the brake were satisfactory.

Gasolene-Electric Motor Car.

The gas or internal combustion engine has been highly developed and has been found economical under certain conditions of service. It is, however, handicapped by being non-reversible and by its limited speed variation. To some extent, these drawbacks can be remedied by using a gas engine to drive an electric generator which supplies current to a motor. This arrangement, despite the losses at the dynamo and the motor, has advantages that offset its seeming complication. The General Electric Co., Schenectady,

center sills are 6 in. I beams, and the outside sills are 6 in. channels; these are braced diagonally.

The seats are upholstered in green leather. There is one light for each seat in addition to those in the vestibule, toilet and engine room. The bottom step folds up automatically as the vestibule door is closed. The car body was built by the Wason Manufacturing Co., Springfield, Mass., in accordance with designs of the General Electric Co.

The gasolene engine is direct coupled to a 90 k.w. d.c. generator, which furnishes current at a variable potential. This current is fed to the motors through a control system governing the voltage of the generator according to the requirements. The two motors are of the G. E. 72-A type, each rated at 60 h.p.

Special attention was paid to simplifying the engine, the number of parts and weight being reduced to a minimum. When running at 550 r.p.m., the engine develops 100 h.p. and has a greater capacity at increased speeds. There are eight cylinders, each of which is 8 in. in diameter with 7 in. stroke. They are set at an angle of 90 deg. to one another, and at an angle of 45 deg. to the vertical. Each cylinder, including its water jacket, is cast in one piece of very soft, fine grain cast-iron. Special attention was paid to provide an extra large cooling surface around the valves to eliminate excessive temperature at the valve seats. There is one inlet and one exhaust valve for each cylinder, and both valves can be inspected by removing of two nuts. The pistons are of the trunk type, are of cast-iron and are made gas tight in the cylinders by three split piston rings. The connecting rods, which are of chrome nickel steel, are connected to the pistons by hollow

pins shrunk into the body of the connecting rods. The crank shaft is a single forging of 0.40 carbon steel. It is a four-throw crank, two connecting rods being coupled to each crank pin. All of the crank pins lie in the same plane, the two center pins being side by side, while the outside ones are set at an angle of 180 deg. to them. This arrangement, in connection with the way the cylinders are set, gives a satisfactorily balanced engine.

Each cylinder is fastened to the engine base by six bolts. The engine base proper is one casting of Parsons manganese bronze; the form is clearly shown in the illustration. The crank casing, which is oil tight, is of aluminum.

All the valves, both inlet and exhaust, are actuated by one cam shaft, driven from the main engine shaft by two gear wheels with the customary 2 to 1 reduction. This cam shaft is enclosed in a circular tunnel formed in the main casting and running the entire length of the engine base. This is one of the ways the engine has been simplified.

There are two float feed carburetors. The ignition system is the high tension type, a small accumulator supplying current to

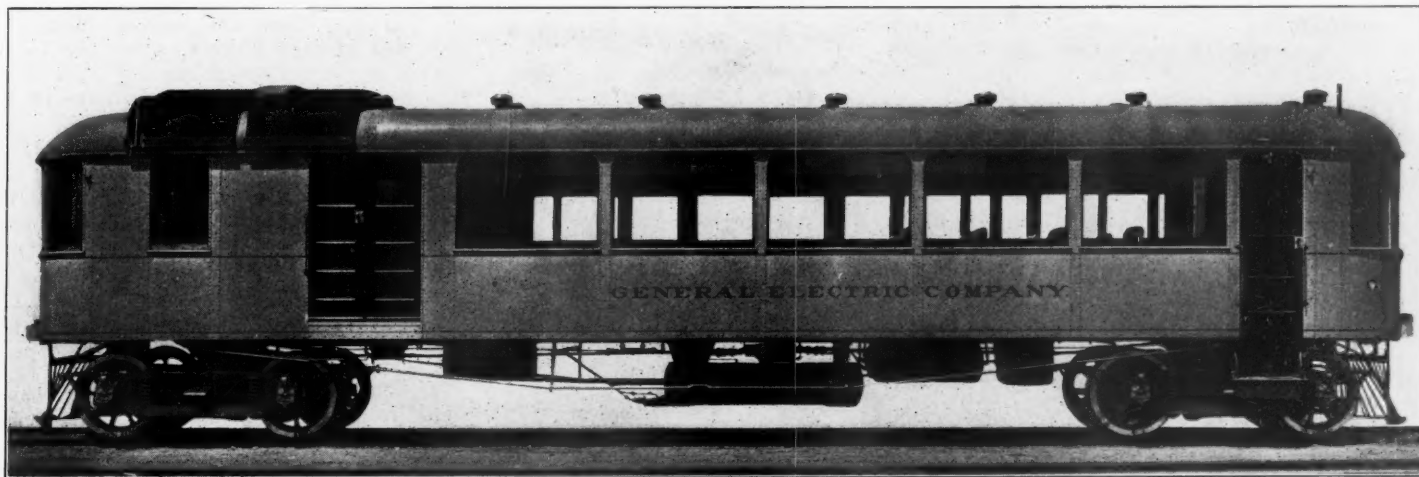


View Showing Front End of Car.

N. Y., recently built a car, shown in the accompanying illustrations, which is operated on such a system. It is a combination passenger and baggage car and has an ordinary passenger compartment, a smoking room, baggage room, engine room, toilet and observation compartment. The car is single ended, the controlling apparatus being in the engine room. The principal dimensions are as follows:

Length, over all.....	50 ft.
Length of engine room.....	9 ft. 6 in.
Length of baggage room.....	5 ft. 8 in.
Length of smoker.....	7 ft. 11 in.
Length of passenger compartment.....	18 ft. 6 in.
Width, over all.....	8 ft. 8 in.
Height, over all.....	12 ft. 10 1/2 in.
Seating capacity.....	44
Total weight of car and trucks fully equipped.....	31 tons

This car was designed throughout with special reference to the service required, the main object being to secure maximum carrying capacity with minimum weight, and at the same time to have a car of great strength. The shape of the ends is parabolic to reduce the air resistance when traveling at high speed. The frame work of the roof and sides is of T irons, bent to the required form and braced diagonally. The exterior is of steel plates,



Gasolene-Electric Car; General Electric Company.

while the interior is finished with Mexican mahogany. No wood is used in the engine compartment. The floors of the passenger and baggage compartments consist of two layers of wood with paper between, armored on the under side with steel plates. The roof, which is fireproof, is of plain oval shape; monitor construction was not employed as it would have added needlessly to the weight. Special attention has been paid to ventilation; in the roof are 12 Globe suction ventilators. The under framing is rigid. The

the spark coils. To start the engine, one of the cylinders is fitted with a device to fire a charge of black powder into it. This mechanism is shown by one of the photographs.

The cooling system for the cylinders operates on a thermosiphon principle. The radiator, which is on the roof of the car, is divided into four separate nests of radiating tubes of the spiral-fin pattern. The total cooling surface is about 1,300 sq. ft. Each pair of engine cylinders is connected to one nest of tubes and the four

nections are connected to each other by three copper pipes. The water jackets are connected to the radiator by pipes running vertically from the engine through the roof and the circuit is completed by other pipes leading from the radiator back to the cylinder jackets. This system needs neither pumps nor cooling fans, and has the further advantage that the pipes can be easily drained and filled from the side of the car.

The gasoline is stored beneath the car in a large steel tank of 90 gallons capacity. It is raised to a small auxiliary tank in the cab by a diaphragm pump, and is filtered in transit from the tank to the pump. The auxiliary tank has a float to register the height of the contents, and a glass tube somewhat like a sight feed lubricator is provided so that the operator can see if the pump is working. From this tank the gasoline is fed by gravity to the carburetors.

Forced lubrication is used, a nest of pumps being operated from the main shaft. There is one pump for each of the main bearings and another oils the cams and cam mechanisms by keeping the cam shaft tunnel filled with oil; the oil on leaving the tunnel flows over the reduction gears and thence to the crank chamber. All the lubricating oil from other parts of the engine also flows to the crank chamber, from which it can be drained.

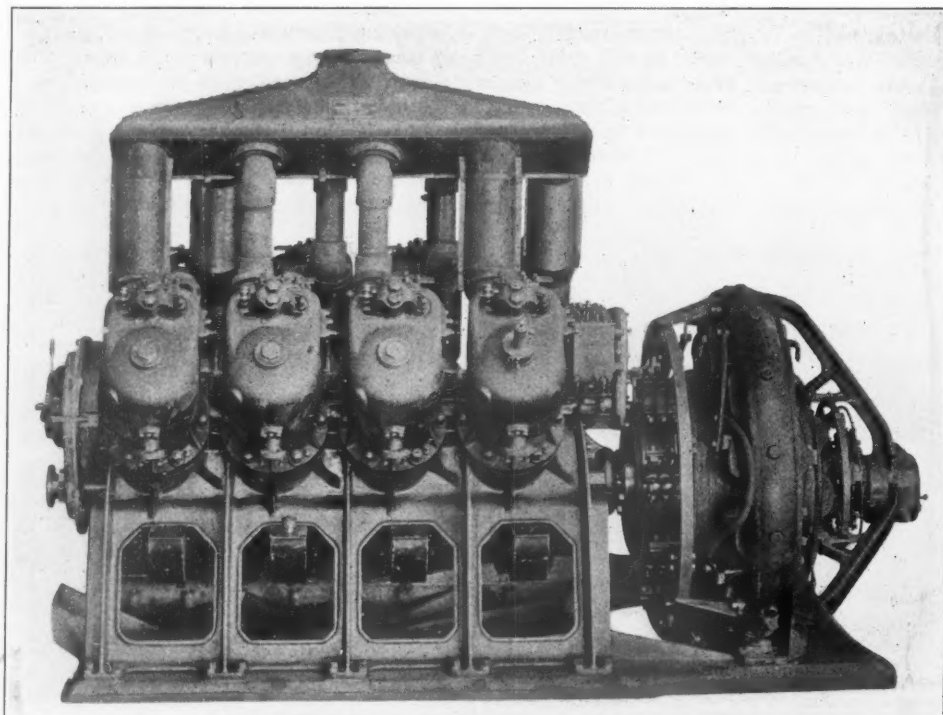
The electric generator is a G. E. 90-k.w., eight-pole separately excited unit, specially designed as the lightest possible machine for the necessary output, while keeping the temperature down to a reasonable figure. It has commutating poles, which, in conjunction with the voltage control, gives it great flexibility. At starting, the field excitation is weak, and large currents are required to give the necessary starting torque. The normal pressure when running at 550 r.p.m. is 250 volts, the current being 360 amperes; but, at the start, a current of 800 amperes can be secured at a corresponding decrease in voltage. It would be impossible to commutate so large a current in a machine with so great a k.w. capacity per pound without the use of commutating poles. The total weight of the generator, including exciter, is only 2,740 lbs.; a standard machine of this output weighs 8,800 lbs. As is only natural in a machine where the weight has been so materially reduced, the temperature rise is higher and the efficiency lower than in standard apparatus of the same output. The higher temperatures are fully provided for by the type of insulation. There is no paper or muslin used anywhere in the machine. The armature coils are insulated with mica, the interpolated pole coils with asbestos and the field coils are wound with enameled wire. The armature leads to the commutator are riveted as well as soldered, although the precaution has been taken to use for soldering pure tin, whose melt-

back ends of the generator armature windings. The illustration of the engine, generator and exciter assembled shows far better than a written description the neatness and compactness of the set.

As already mentioned, the speed of the motors is governed by voltage control. The generator is separately excited and the termi-



Firing Mechanism for Starting Motor.



Gasolene Engine and Electric Generator; Gasolene-Electric Car.

ing point is over 200 deg. centigrade. Air ducts of ample dimensions are provided to insure the circulation of a large volume of air through the core. The efficiency is 88 per cent., being only about 3 per cent. lower than that of a standard machine having a temperature rise of 35 deg. centigrade. The exciter is a 3-k.w., 70-volt, shunt-wound machine with its armature mounted directly on the armature shaft of the main generator and its field yoke supported by the bearing brackets, enabling it to fit under the

nal voltage at the motors is varied by a rheostat in series with the exciting circuit. The armature circuit of the main generator comprises the armature, a fuse, two contactors in series, the reverser and the two motors. The motors are connected in series or in parallel, according to the position of the controller handle, and they are grounded to the truck framework. The solenoid coils for operating the contactors are energized by a storage battery floated on the field circuit. The reverser is operated as usual by a separate reverser handle on the controller. The current from the exciter passes around the field of the main generator and through the rheostat. A storage battery floated on the exciter circuit supplies the lighting circuits and its charging and discharging are controlled by a reverse current relay by which the lights can be supplied directly from the exciting circuit or from the storage battery, according to the voltage of the exciter circuit. A Tirrill regulator is used to regulate the voltage on the lighting circuit.

The master controller is of type C-44, and gives seven steps with the two motors connected in series and eight steps with the two motors connected in parallel. It is provided with four handles, three of which are mounted one above the other on concentric shafts. The top handle advances or retards the ignition; the second is the gas throttle; the third controls the generator field resistances and the contactors which establish the circuit for the motors, besides transposing the motor connections from series to parallel. The fourth handle operates the reverser.

The car is heated by passing part of the exhaust gases through pipes suitably located in the car body. Air for the straight air-brake equipment is supplied from a compressor direct-connected to the engine. The working pressure is 60 lbs. per sq. in., and this is kept constant in the storage tank by a mechanical governor. Hand-brakes are also provided. The trucks were built by the American Locomotive Co., New York. They are of the swing bolster type and have wheels 36 in. in diameter. One motor is mounted on each truck. The journals are M. C. B. standard.

The interior of these cars can be designed to suit any requirements or service. They are available for use as private cars, with

sleeping and dining accommodation, or as inspection cars, wrecking cars, baggage cars, etc.

A run was recently made with the car over the tracks of the Delaware & Hudson from Schenectady, N. Y., to the junction with the Susquehanna division, thence to Albany, Cohoes, Mechanicsville and back to Schenectady, about 78 miles in all. The car carried its full complement of passengers and made 23 stops, the engine running continuously. The speed varied from 23 miles an hour on a 1.3 per cent. up grade to 56 miles an hour on a $\frac{1}{4}$ per cent. down grade, except where traffic conditions and road regulations required lower speeds. Where traffic conditions permitted, a speed of 50 miles an hour was recorded on level track, and from Albany to Mechanicsville 47 miles per hour was sustained on a steadily rising grade. The operation of the equipment was in every way satisfactory, neither vibration nor sound of the engine reaching the passengers. The car heated readily from the exhaust system although the day was cold and the air keen. The gas engine developed at times 150 h.p. and the two motors were under such control that the acceleration was noticeably smooth and free from jerks.

The Ocean Carrier.

BY J. RUSSELL SMITH, PH.D.

IV.

*Line Traffic and Its Extension.**

The British Government, which had been the pioneer founder of steamship lines in 1822, did so because private citizens did not seem to be able to fill the need. By 1838 the government was able to hand some of the work over to private firms and the first regular transatlantic line, the result of the British mail contract, was really a subsidized line. Without such aid a transatlantic line in the period of 1840 to 1860 was in a precarious situation as witnessed by the speedy failure of most of those attempted during the period.

The Cunard, starting with a strong subsidy and backed by the support of the government, kept steadily on, as also did the Inman Line, which started 10 years after the Cunards, and after 1856 shared the mail contracts with them. By 1861 there had been 12 distinct attempts at steam connection between United States and England, and only these two had survived although the second Glasgow line had then been running five years.

Between 1840 and 1850 the old packet lines were as numerous and as fast as ever, and they occasionally beat the Cunard steamers, even when that line had been 15 years running, but these performances were unusual and far from the average. The Cunarders had their own way with mail, with the express freight which paid \$36 per ton, and also with those passengers who could afford a costly journey, for the charges were much above the packet fares. During this decade the steamers carried only first and second class passengers, although the third class, then as now, made up the bulk of the travel and was very profitable. All of this class, from necessity, still traveled in the packets which were on the whole well able to compete with the steamer lines and were effectively doing so as was proved by the repeated failure of steamer lines during the period 1840-1860. Up to 1850 the steamer certainly could not have held its own, without the aid of the subsidy. The decade 1850-60 witnessed the real establishment of an economically self-sustaining ocean steamship line traffic on the Atlantic.

The full list of the failures in this transition period need not be enumerated here, but at least four American attempts of the period are worthy of attention.

The success of the Cunard steamers was a great blow to American pride. Our newspapers had for decades been rejoicing in no moderate terms over the triumphs upon the sea that had been won by our world-famed packets and clippers. Then the British line steamers sailed into our ports, and the speed records were held by the other side. In 1847 an attempt to win back these laurels was made by an American corporation, the Ocean Steam Navigation Company, which started the first of its two steamers, "Washington" and "Hermann," to Bremen via Southampton (Coves) on June first. But it was counted a failure because the Cunard steamers made from two to four days better time. The American Government mail payment was \$200,000 per year, but the British authorities discriminated against the American-borne mail. The city of Southampton gave the line no welcome and it was continued only a short time.

While this line was leading its cheerless existence, another of similar performance but longer life began operations. An American company, the New York & Havre Steam Navigation Company,

organized in 1848, sent its first steamer, the "Franklin," in 1850; a second steamer was put on the next year and the company with difficulty managed to maintain a two-boat service until the outbreak of the Civil War. The gap was thereafter filled by the French Transatlantic Company, founded in 1860.

But this line to France did not even pretend to be in the Cunard record-breaking class. The failure of the one American attempt in this direction goaded the nation to more determined efforts. The idea of naval dependence was brought before the public mind by the carrying of all steamer mail by the British. The packets were recognized as useless for this race. The nation was stirred and a subsidy was granted to E. K. Collins, owner of a line of packets running from New York to Liverpool. He contracted for 20 voyages a year and was to receive \$19,250 per voyage; later it was raised to \$33,000, or \$858,000 per year. No pains were spared in the effort to beat the British. The national spirit was shown by contractors who assisted in the enterprise by delivering to Mr. Collins at cost.

In 1850 the Americans were ready. Mr. Collins sold his packet ships and launched his fortune on the sea in his great new wooden paddlewheel steamers, having the unheard-of boiler pressure of 13 lbs. per sq. in. This race between Britain and America was a world event and Mr. Collins beat the Cunards. He beat them once and beat them regularly, the average difference in time of voyage for the two lines in 1851 being seven hours going east and 18 hours going west; the annual average time of the Collins steamers for that year being a fraction over 11 days and the Cunard slightly over 12 days. It is interesting to note that in the 96 trips made by these two lines between New York and Liverpool that year they carried only 8,268 passengers, an average of but 86 per trip. They were almost evenly divided, but the smallness of the number will help to explain the lamentable failure of the Collins Line a few years later.

This competition was in more than speed. It was an inroad upon the Cunard's monopoly. Upon the opening of the Collins service the steamship freight rate fell from £7, 10s. to £4—a rate which to-day would seem like the most Heavenly kind of manna to the owners of ocean greyhounds.

In December of 1850, the same year that the Collins Line began, the Inman Line (British) established a fortnightly service between Liverpool and Philadelphia, and made the innovation of giving full and complete competition with the clipper ships by providing for third class passengers. This was a popular move which was copied three years later by the Cunard Line. The Collins Line still represented the strictly express type of service built for speed, at which it succeeded. It thereby added great laurels to the American flag and name, but it netted only losses to the stockholders. In 1854 one of their steamers, the "Arctic," was lost in collision on the Grand Banks. Two years later, the "Pacific" disappeared at sea with Mr. Collins' wife and two children on board. Then, even worse for the fate of the line, the great subsidy upon which it had rested was withdrawn, due, some say, to the jealousies of Boston, Philadelphia and Baltimore, and to the business jealousies of the clipper ship owners who made a combination in Congress which killed the Collins subsidy, and this promptly killed the Collins Line. It made its last voyage in 1858. During the eight years of its brilliant, but unfortunate career, the passenger traffic had increased five fold.

The experience of this line with the subsidy shows how unstable the company is that depends upon the repeated votes of a legislature dominated by party politics. The government support of the Cunard Line was never violently withdrawn.

Upon the failure of the Collins Line, the Inman Line swung its Philadelphia service to New York and took the Collins dates and kept up the bi-monthly service. In 1860 it became weekly, 1863 three in two weeks, and in 1866 bi-weekly in summer.

Another sturdy American, Vanderbilt, tried to follow in the footsteps of Collins and get a subsidy for a route to the continent. He labored hard in this cause and failing to get a subsidy, he determined to put on steamers anyhow. In 1855 he began service from New York to Havre and Southampton. The next year he extended it to Bremen and in 1858 he got the contract for carrying the mail and was paid the amount of the actual postage receipts. In 1861 he gave it up and sold most of his steamers to go to the Pacific, and retired from the Atlantic carrying trade.

The year 1856 witnessed the founding of a line, the second attempt, which was probably more nearly a freight line than any other of the period—the Anchor Line from Glasgow to New York. This service, with its greater dependence upon freight, marks another stage in the progress of the development of line traffic and of the replacing of sail by steam lines. From 1850 until 1870 this replacing continued steadily, and with increasing speed. The new lines were usually steam lines, and the old lines gradually changed their vessels from sail to steam. The Hamburg-American Packet Company, incorporated in 1847, had sailing vessels only, for nine years, and then in 1856 a screw steamer was added. Others

*References: *Westminster Review*, 101:368; *Chambers' Journal*, 15:392; *Hunt's Merchants' Magazine*, 17:358; *Lindsay's History of Merchant Shipping*, 4:224; *Westminster Review*, 101:367; *Fry's History of North Atlantic Steam Navigation*; *Wheelwright's Pacific Steam Navigation*; *Hunt's Merchants' Magazine*, 29:116; *Lindsay's History of Merchant Shipping*, 4:151-6; *Chambers' Journal*, 22:189; *Journal of the Society of Arts*, 8:164; *Scribner's Magazine*, 70:156; *Living Age*, 165:784; *Scribner's Magazine*, 10:267.

followed and in 1860 the nine remaining sailing vessels on the line were replaced by four new steamers and fortnightly sailings to New York were inaugurated.

The old Black Ball Line, the pioneer between New York and Liverpool, the pioneer of all the Atlantic lines, had 25 fine sailing ships in 1850. But the competition of the new lines of steamers was such that they had to be merged shortly into the Guion Line, and this company in 1863 made an arrangement with the Cunard Line to carry some of its passengers in the Cunard steamers. In 1866 the Guions added their first steamer and in eight years more they had a steam fleet. The decade 1860-70 marked the practical disappearance of the old transatlantic packet-ship lines and their final replacement by lines of steamers. The last days of the packet lines found them carrying emigrants while the first and second cabin passengers were taken by the steamers. The White Star Line was an example of this transformation of an established line traffic from one type of vessel to another. The present service had its origin in the purchase of a sailing vessel fleet in 1870, their immediate transference to another service and their replacement by steam vessels.

The summer of 1856 saw the establishment of the subsidized Allan Line steamers from Montreal to Liverpool by an old firm of merchants and sailing ship owners who had been running their vessels in the Montreal-Glasgow trade for a quarter of a century. The first ocean steamer to reach Montreal came in 1853, and for two years there was a poor, irregular service, but it was so irregular that the government canceled its mail contract, and the next effort was the more liberally paid Allan Line, which succeeded and maintains itself to the present day.

In 1866, the North German Lloyd Line from New York to Bremen, which had been founded with steamers in 1858, increased its service to once a week. Between 1866-70 it succeeded in beating out three attempts of New York capitalists headed by Henry Ruger, who tried to establish competitive service to Bremen and to Scandinavian ports. In 1869 the Bremen company started a steam service to New Orleans. The next year the New Orleans cotton merchants, who had been depending on sail for their direct shipments to Europe, formed the Mississippi and Dominion Steamship Company, which ran steamers from New Orleans to Liverpool in winter when the cotton season was on and in summer when the St. Lawrence was open they went to Quebec and Montreal. This New Orleans service was not long lived. It was shifted to the New England and Canadian ports and there became known as the Dominion Line.

The period of 1840-60, that of the founding of steam line traffic on the North Atlantic, was also the period of its establishment in nearly all parts of the globe.

It is rather remarkable that the backward, warring and disturbed countries on the west coast of South America should have had upon the Pacific ocean one of the earliest of oceanic steamship lines, but there were peculiar reasons for this. The topography of the coast made land travel to any distance absolutely impracticable. The sea was the only highway and here the peculiarities of the winds were such that sailing vessel communication was exceedingly slow and tedious. William Wheelwright, an enterprising American, who had spent some years on those coasts as consul, appreciated the situation and went to Europe to raise money for a steamship line. His pamphlet stated that "by steam many voyages would be performed in 40 or 50 hours which now occupy 20 or 25 days." The explanation of these disparities he showed to be a combination of southeastern trades and prevailing westerly winds to the south of them which made it necessary for a sailing vessel bound on a mere coasting journey to go far out into the Pacific to get the requisite winds. Mr. Wheelwright secured his financial support and the first two steamers reached their station in 1840. In 1852, there was a bi-monthly service from Valparaiso to Panama, where it connected with the Atlantic navigation. In 1865 the service was extended around the southern end of the continent to the River Plate and the Falkland Islands, and two years later regular steam connection was had with England through the Straits of Magellan.

At first Wheelwright's English line, the Pacific Steam Navigation Company, had great difficulty to secure the necessary fuel which had to be brought around the Horn in sailing vessels. In this respect it was identical with the Pacific Mail Steamship Company, an American company, giving service from Panama northward.

The acquisition of California gave the United States an exceedingly remote possession (there is no colony anywhere so really remote to-day). With this territory some kind of connection was imperative and the administration, which was so liberal in helping the Collins Line to beat the British, contracted with the Pacific Mail Steamship Company, formed in 1847, for a service from Panama to Astoria and from New York, Charleston and New Orleans to Havana, from which port the company already had a connecting line to Chagres (Colon), thus completing the connection between the coasts. The first steamer left New York October 6, 1848, and the company soon had six of the finest steamships afloat. The speed

from Panama to San Francisco was more than 10 miles per hour. Thus the United States had line traffic of first class character connecting its remote coasts before it had a good American line to Europe. At Panama it connected with the Pacific Steam Navigation Company, giving service to Peru and Chile, so that before the middle of the century the Pacific had at least 5,000 miles continuous steam line traffic. The success of the United States government's line on the Pacific was far more enduring though somewhat less brilliant than that of the Collins Line. Its steamers had not reached the coast before the gold fever set rovers from all over the world flying toward California. Despite the troubles of 'round-the-Horn coal, the company, dropped by chance in the golden stream, reaped a golden harvest, and when railroad competition began shortly after 1870 it was by all means the largest American maritime organization. It had 33 fine steamships capable of holding 74,000 tons of cargo and many passengers. It served 47 Pacific and three Atlantic ports and had 35 agencies in the Orient, United States, Spanish-American and Europe. On January 1, 1867, it had begun a monthly service to the Orient, terminating at Hong Kong. This was soon made a fortnightly service and a branch established at Yokohama to skirt the Japanese inland sea and go on to Shanghai. There was an express steamer from San Francisco every two weeks, connecting with the New York steamer via the Panama Railway. There was also an accommodation steamer which attended to the local needs of the coasts of Mexico and Central America, and at Panama connection was had, not only with New York, but also with lines to Hamburg, Havre, Southampton and Liverpool.

England pushed out her steamer lines to her colonies about as quickly as she had to America. "In 16 years after the crossing of the North Atlantic, regular lines of steamships traverse both the North and South Atlantic, the Indian ocean, the Arabian sea, the Mediterranean sea," etc.

The same burst of confidence and mechanical enthusiasm that started companies to building steamers in 1836 for the North Atlantic, sent two steamers out to India in 1836 and 1837 to ply between Bombay and Suez. This line soon became a link in one of the largest and certainly the oldest steamship companies in the world. The present Peninsular & Oriental Company started as the London & Dublin Steam Navigation Company, running two steamboats about 1824. This enlarged in 1837 into a line running steamboats to the (Iberian) Peninsula, hence the name Peninsular. Before this innovation, the sailing vessel time from London to Lisbon had been three weeks. As the next step in the development of its service and its name, the Peninsular Company took a subsidy in 1842 to carry the mail in steamers between Alexandria and London. At Alexandria it connected first by camels and then by four-horse vans with the Suez Line to India—a service which has been maintained to the present day and extended to the east and southeast, taking in China and Australia. The Australian Line came in 1873 after the opening of the Suez Canal permitted the abandoning of the bothersome shifting at Suez and substitution for it of a continuous steamer voyage.

Australia appears to have first had line traffic connection with the mother country in 1850 when a lively sailing vessel traffic was deemed of enough importance to be reduced to a schedule. In 1852, the desire for greater regularity of mail brought about a contract for the carrying of the mail in steamers. The first steamer sailed June 5, 1852, and between that and 1854 several others were successively added.

In the fifties, the South African traffic was carried in sailing vessels with the exception of such service as the first Australian steamers rendered. In 1857, the Union Steamship Company, which after 50 years, still dominates the South African situation, entered into a contract to carry the British mails. In 1872 the Castle Line was founded. In 1873 it participated in the mail contract, and in 1876 it shared equally and helped maintain the schedule.

The pioneer in the service from England to eastern South America was the Royal Mail Steam Packet Company, which started its first steamer from Falmouth in 1842 and has since built up a great service and met the rivalry of many companies.

It appears that the Atlantic ocean can scarcely be called the pioneer in the establishing of ocean steam line traffic although it certainly had been in the sailing traffic. Experiments were being made in all oceans at the same time, and the period 1840-1857 is the epoch of the establishment of steam line traffic to all important quarters of the globe. There were lines on the North Atlantic, fast, fine and competing. These were the backbone of the world's connection. At New York the American Pacific Mail Line gave connection through Panama with the Pacific coasts of both Americas. The Cunard Line had connecting lines here to Bermuda and West Indies.

On the other end of the Atlantic trunk, the English lines gave quick access to the Mediterranean and India, to South Africa and Australia. The world was connected. The rest is a story of improvement.

(To be continued.)

GENERAL NEWS SECTION

NOTES.

The Baltimore & Ohio has issued a notice that employees must abstain from the use of intoxicants both while on and while off duty.

The Baltimore & Ohio has reduced by 10 per cent. the pay of all officers and employees receiving \$166 a month or more and reducing to \$150 all now receiving between \$150 and \$166.

At Kansas City, Jan. 21, D. H. Kresky and W. A. McGowan, the former agent for a shipper and the latter for a railroad, were fined \$1,000 each for violation of the freight rate law. They were indicted two years ago.

Acting on a complaint concerning the compression of cotton in Oklahoma, the Interstate Commerce Commission has decided to hold a general inquiry into the whole question of compression and the relations of the railroads to compressors, buyers and shippers everywhere.

A press despatch from Pottsville, Pa., says that some of the employees of the Pennsylvania Railroad at that place have been furloughed for nine months. By taking this course, instead of dismissing the men, the company reserves to them their rights and privileges as regards promotion.

At Denver, Colo., the United States District Court has issued a temporary injunction requiring ticket brokers to conform to the recent decision of the United States Supreme Court in the Bitterman case, outlawing all outside dealing in tickets which, according to their terms, are non-transferable.

The Philadelphia, Baltimore & Washington has conveyed to the government by deed the recently abandoned passenger terminal at Sixth and B streets, Washington. The railroad surrenders its right to use any portion of the mall; and the sum of \$1,500,000, to be contributed by the government toward the cost of the new union station, now becomes payable.

The State Railroad Commission of Illinois has directed the Cleveland, Cincinnati, Chicago & St. Louis to run one passenger train each way daily over the Kankakee & Seneca branch regardless of the probability that the trains will earn less than it will cost to run them. Hitherto for many years the company has maintained only a freight service on this branch.

Those employees of the United Steel Corporation who subscribed for preferred stock in 1903 under the profit sharing plan and have since held their stock, are to receive an extra dividend of \$65.40 in addition to the regular 7 per cent. dividend and the regular bonus of 5 per cent. a year. Next year, stock subscribed for in 1904 will be entitled to a similar extra payment.

The Railroad Commission of Wisconsin, which is investigating the action of the railroads under the law of that state limiting telegraphers' work to eight hours a day, finds that the Chicago, Milwaukee & St. Paul has discontinued 63 telegraph offices; the Chicago & North-Western 41, and the Wisconsin Central 36. These all did commercial business, but the roads had to have the operators to put into more important stations to comply with the law. It is probable that the telephone will be extensively used by these railroads.

The Pennsylvania Railroad, in reporting monthly earnings to the Government, declines to make affidavit that the accounting rules issued by the Interstate Commerce Commission have been followed, and the New York Central, it is said, has made no monthly reports whatever. The Government proposes, therefore, to proceed against these roads for not complying with the law. Notice has also been given that henceforth all roads will be required to send their monthly statements within 10 days after the end of the month, as required by the rules issued by the Commission.

The railroads centering in Manhattan, Brooklyn, Long Island City and Jersey City have agreed on "track service charges" in addition to car service (demurrage) charges at congested stations, to be put in effect Feb. 20, amounting to \$1 a day (total demurrage and track charge \$2) for the third and fourth days; \$1 additional for the fifth and sixth days and \$1 more for the seventh, making the gross rate after the sixth day \$4 per car per day. Coal, coke and hay are excepted from this regulation. It appears that the Long Island Railroad has decided not to abandon this "track charge" as was proposed a few weeks ago.

At Washington last Monday a number of prominent railroad officers called on the President and on the Interstate Commerce Commission to see what could be done towards securing the amendment of the law limiting the hours of telegraphers and signalmen,

which comes into force in March, but it does not appear that the conference produced any tangible results, and the Washington reporters seem to think that Congress will be very slow to take action on any modification of the laws affecting railroads. The Chief of the Order of Railway Telegraphers says that there are plenty of competent telegraphers in the country.

At the conference called by Governor Patterson of Tennessee at Nashville last Tuesday to see if the railroads would reduce passenger fares, the Southern repeated its former announcement that rates would be reduced in Tennessee to the basis which is to be adopted in Georgia, and the Mobile & Ohio and the Cincinnati, New Orleans & Texas Pacific announced that they would follow the action of the Southern. The other roads represented said that they could not afford to make the desired reduction. President Smith of the Louisville & Nashville said, however, that if the surrounding states succeeded in securing a reduction of passenger fares on his road the company would adopt the same reduced rates in Tennessee. The Illinois Central made a similar promise. Meanwhile the order issued by the State Railroad Commission requiring all rates to be reduced on April 1 to the basis of 2½ cents a mile still stands.

In an opinion by Justice Peckham the Supreme Court of the United States has decided the case of the Penn Refining Company, of Oil City, against the Western New York & Pennsylvania and the Lehigh Valley in favor of the railroads. The independent refiners of Western Pennsylvania charged that the privilege of shipping in tank cars, permitted to the Standard Oil Company, was denied to the other companies. The Interstate Commerce Commission ordered the railroad companies to pay damages of \$13,000, and the United States Circuit Court for the Western District of Pennsylvania upheld the order. That court, however, was reversed by the Circuit Court of Appeals, and the independent refiners took the case to the Supreme Court, which now has affirmed the decision of the Court of Appeals. In his opinion Justice Peckham said:

The whole theory of discrimination rests upon the alleged failure to furnish tank cars to shippers demanding them, while at the same time the defendants (the railroad companies) leased tank cars from their owners and used them to carry the oil of such owners exclusively; and yet in this case there has been no such failure because there has been no demand for such cars by the refiners, who had no use for them. . . . It is therefore apparent that the failure of the plaintiff to use tank cars was not owing to refusal or omission of the defendants to supply them, but because the plaintiffs did not demand and could not use them economically for the transportation of oil.

Detector Bars Abandoned.

The Pennsylvania is making great improvements in its interlocking towers. A new electro-pneumatic machine, with latest improvements in locking up fouling points electrically, has just been installed in the tower at Henderson street, Jersey City. This does away with the old-style detector bars used on switches as, until the route is perfectly clear, the track circuits keep the signal lever locked. The drawbridges across the Hackensack and Passaic rivers have been similarly equipped. (Approach track-circuit locking.) Five towers on the New York division are now equipped in this way and all others will be in due time.—*Newark (N. J.) Call.*

Cement Makers' Association.

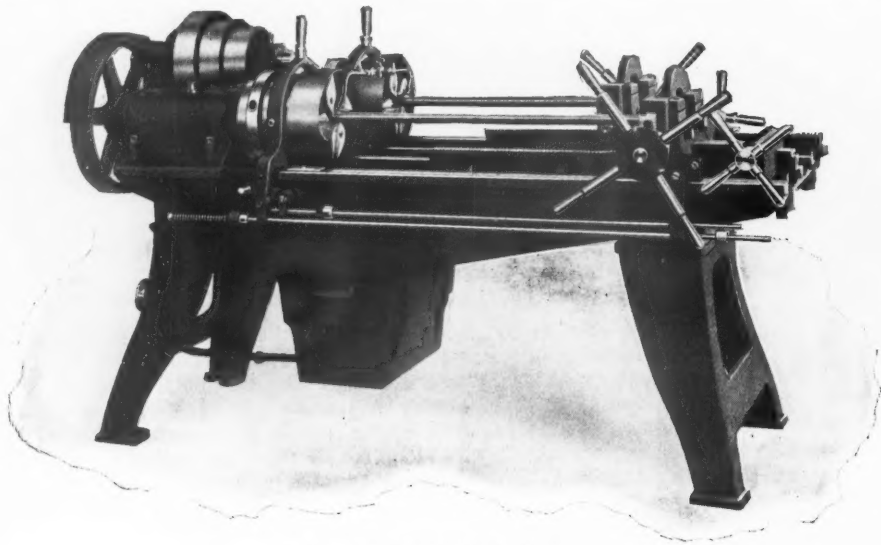
The Association of Licensed Cement Manufacturers, 30 Broad street, New York, was organized on January 9 by the North American Portland Cement Co., the Atlas, Alpha, American, Lehigh, Lawrence and Vulcanite Portland cement companies, and various other companies in the East and West, including the Dexter, Edison, Nazareth, Pennsylvania, Penn-Allen and Catskill companies, all of which have secured licenses under the Hurry and Seaman, Edison, Carpenter and other patents controlled by the North American company. The association already represents nearly 70 per cent. of this country's Portland cement output, and other applications for membership have been presented and are under consideration. The officers of the association are: President, A. F. Gerstell, Vice-President and General Manager of the Alpha Portland Cement Co.; Vice-President, Conrad Miller, President of the Dexter Portland Cement Co.; Secretary and General Manager, Alfonso De Navarro, Vice-President of the Atlas Portland Cement Co.

The purposes of the association include: the betterment of the mechanical and chemical processes used in making cement, the improvement of the quality of cement, matters of traffic and shipment, and the establishing of an association laboratory for technical tests

and experiments. It is understood that all existing and properly equipped cement plants will be granted licenses and admitted to membership. Infringers of the patents above referred to will be rigorously prosecuted.

Landis Staybolt Cutter.

The illustrations show the new Landis staybolt cutter, recently placed on the market. It is equipped with Landis patent dies. The chasers are each 4 in. long, with threads milled on the flat side and running the full length. These chasers are set tangent to the rod, being threaded to give the right cutting clearance. The rake can be ground to any angle desired to suit the kind of material that is being



Landis Staybolt Cutter.

cut, and a rolling chip is cut just as from a lathe tool, so that the thread can be cut at high speed. All chasers are interchangeable.

The die requires no lead screw to govern the pitch of the thread that is being cut. The chasers are not hobbled but milled, and they are held so that the front or working teeth do the cutting, while the back teeth do no cutting, but extend across the cutting line, so that the four chasers form a lead nut which bears on the threaded rod and draws it into the cutting teeth true to the pitch of the die. This lead is so positive that it is impossible to influence the pitch of the thread by retarding or forcing the rod into the die. Before such action could affect the pitch either the threads would be stripped off the rod or the teeth would be pulled off the die. This leading feature is permanent, as the die never needs to be ground in the throat; the ends only of the chasers are ground, which keeps their shape uniform. In machines using lead screws there are at least two hardenings and one screw, whose inaccuracy must be corrected to get the right pitch. The best lead screw made must be cut with some form of die or on an engine lathe where accuracy cannot be guaranteed. In the Landis die there is but one hardening—the hardening of the die. When lead screws and dies are not of exactly the same pitch a bad and distorted thread will be produced. The lead screw will work against the dies, and the lead screw nut being the most powerful of the two the die is bound to distort the thread, giving it a ragged appearance and frequently pulling off the tops of the threads, as all of the teeth can shave the thread in the hobbled die. The die in the Landis machine never needs to be annealed, hobbled or retempered. Its life is much longer and it has a much wider range on special diameters.

The carriage on the machine can be adjusted upward, downward and sidewise, and the cutting strain is central. The rack has recesses between the teeth, so that when chips or scale drop on the rack they will fall through and not interfere. The machine is built single and double head, in sizes up to 1½ in. Each machine is provided with pump, countershaft, wrenches and automatic throw-out. The main spindles are so arranged that any oil which may be carried into the spindle will feed back into the oil tanks and not be carried out at the rear end of the spindle to run on the floor.

The machine is manufactured and sold by the Landis Machine Co., Inc., Waynesboro, Pa.

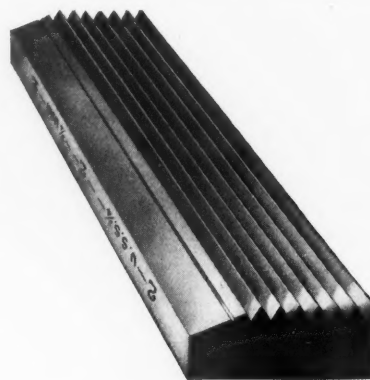
Passenger Fares on the Pennsylvania.

The Supreme Court of the state of Pennsylvania having decided that the act of the last Legislature fixing a maximum passenger fare of 2 cents a mile is inapplicable to the Pennsylvania Railroad, its branches and leased lines, the company announces that on Feb. 1 it will restore the schedule of fares which had prevailed from Nov. 1, 1906—when the maximum one-way rate was voluntarily reduced to 2½ cents a mile—until Oct. 1, 1907. On the latter date, when the

2-cent fare act became effective, all one-way rates were reduced to conform to the law as it stood. The system of passenger fares which prevailed prior to Oct. 1 will, after Feb. 1, again apply to all portions of the Pennsylvania Railroad within the State of Pennsylvania, including the Buffalo & Allegheny Valley, the Philadelphia & Erie, and the United Railways of New Jersey grand divisions.

But as the act is held to apply to the Pennsylvania Railroad and its branches only, the 2-cent rate, until cases now pending before the courts are decided, will be retained on such portions of the Philadelphia, Baltimore & Washington and the Northern Central as are within the state of Pennsylvania and on the Bedford division and the Lancaster and Quarryville branch.

The company will also resume the sale of 180-trip three-month tickets, 100-ride tickets (good within a year) and all other commutation privileges which were withdrawn pending the decision of the courts. Although the 2-cent rate will still apply to the Philadelphia, Baltimore and Washington Railroad, the company will, after Feb. 1, restore all commutation privileges which

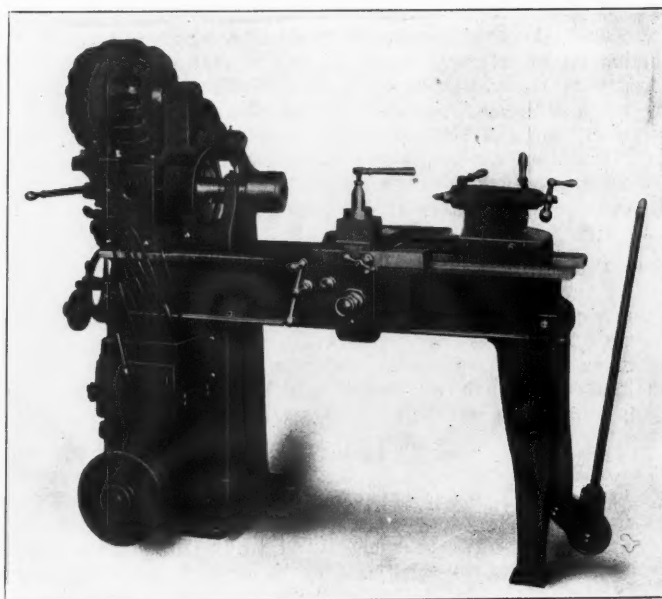


Chaser for Landis Die.

were withdrawn Oct. 1, 1907. Pending the decision of the courts, the Pennsylvania Railroad and its affiliated lines East of Pittsburgh, Buffalo and Erie withdrew the issuance of orders for special rates to clergymen living along these lines. Beginning March 1 clerical orders will again be issued, the amount of work involved in preparing them making this delay unavoidable.

Portable Lathe Driven by Westinghouse Motor.

Electric motor drive has brought into use several convenient and labor-saving portable machines. An example is the portable bolt-turning lathe, for use in locomotive repair shops. The illustration shows a lathe made for this purpose by the Williams & Wilson Co., Montreal, Que., equipped with a Westinghouse motor. They form a compact unit, which is mounted on wheels. It can be



Portable Lathe, Driven by Westinghouse Motor.

lifted by a crane and placed beside an erecting pit and then shifted as desired by hand. When in working position the machine rests on the two rear wheels and the front legs. To move it, the legs are lifted from the floor and the load thrown on the front wheel by simply lowering the handle, which acts as a lever.

The motor is the induction type, 2 h.p., 1,700 r.p.m., connected

through a friction clutch, providing for either 200 or 400 r.p.m. of the spindle. Direct current motor applications are equally successful. Current is carried by flexible cable connection to plugs located at convenient intervals. A simple and convenient connecting plug is made for the purpose. The advantages in the use of a machine of this type in work that requires turning each bolt to the proper size is readily apparent. It saves trips to and from the machine shop and enables the mechanic to do his work without interruption.

The Hendershot Shaft Coupling.

A new shaft coupling, to be known as the Hendershot coupling, is being put on the market by Manning, Maxwell & Moore, Inc., New York. The assembled coupling and the parts are shown in the accompanying illustrations. The advantages claimed for it are unusual strength, and quickness and ease of application.

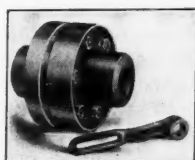


Fig. 1.

The internal surface, 3, on shell B, and the external surface, 4, on shell A, true up the coupling to approximate alignment which is made exact by keeping the faces 1 and 2 parallel while adjusting the coupling. This saves a good deal of time, particularly in a new factory where it is not convenient to start up to see how the line runs. The use of two sleeves makes it possible to put the

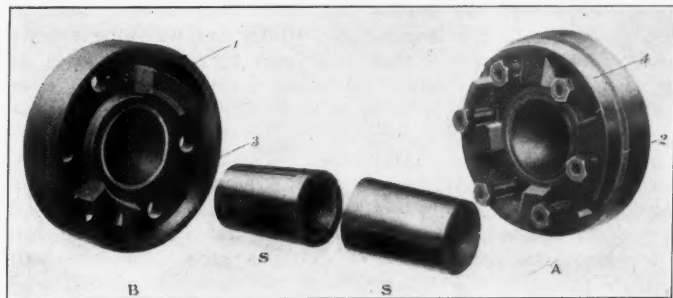


Fig. 2.

two halves of the coupling in place while the shafting is on the floor. It may then be hoisted into position and bolted together as easily as a plain flange coupling. In uncoupling, the shells can be drawn apart by screwing two bolts into holes tapped for this purpose. If the shafts to be coupled are of slightly different sizes or are a little out of line, or both, this coupling adjusts itself and the compression will be the same on the whole length of the sleeves. The strength of the coupling is increased, without increasing its outside diameter, by making the sleeves thinner and the hubs heavier. It is made of gray iron.

Trifles Make Perfection.

T. F. Whittelsey, General Manager of the Seaboard Air Line, has issued a general order, in which he says that "all officials and employees of the Seaboard Air Line Railway when answering telephone calls should do so with a rising inflection of the voice. The telephone is to a large extent the voice of the company, and we should assure our patrons that we are eager to communicate with them and in a cheerful and accommodating manner."

Third Class in China.

An Englishman who ventured his life in a third class car on the Shantung Railroad, where the trainmen are Chinese, found it disagreeable. These cars have three compartments, intended to hold 20 passengers each; but sometimes twice as many squeeze in. The rules say that a passenger may take into the car only so much baggage as he can carry in his hand; but it is common for one to have a pile of boxes, baskets and packages, sometimes making a respectable bale. Often the passenger piles the seat full of baggage and himself sits on the floor. Some bring bedding with them, and if they get into the car while there is room, they spread it on the floor and sleep, remaining undisturbed by the guard, however the car may be crowded afterwards. Meanwhile the air becomes thick with the smoke of Chinese tobacco, Japanese cigarettes and Manila cigars. The floor is littered with egg and peanut shells, sweet potato skins and melon seeds, and slippery with spilt soup and spittle. In the course of a few hours the car looks like a hogan. The Chinese trainmen are obeyed by the Chinese passengers; but shrink before a European. A German tramp, without ticket,

money or baggage, traveled on his face in a third class car nearly the whole length of the road. The trainmen would not venture to put him off.

John R. Walsh.

John R. Walsh, President of the Southern Indiana Railway, and late President of the Chicago National Bank, has been found guilty of violating the national banking laws in making loans irregular in form and without the knowledge and approval of the directors. That the acts were reckless and wrong, the evidence is convincing, but that they were with criminal intent there is no evidence, and, based on this, an appeal has been taken from the verdict. An acquittal was given in all the counts relating to the railroad company. This is a case of a great man and a good man, attaining great power, uniformly acting for the benefit of the community, and in this accomplishing great results and doing good in the world. With nearly uniform success from the time when he began as a Chicago newsboy, it was natural to get a confidence in his own judgment which made him impatient of control and perhaps arrogant in administering the affairs of a bank and the funds of depositors and stockholders. His fellow-directors were at fault and he was at fault, but for the purpose of estimating his character it is a fair plea in abatement to note that he became a banker late in life and in making loans without the knowledge of his directors he followed many precedents, and also that after the failure, by wonderful vigor and with sturdy integrity, he saved his depositors from loss.

Earnings of the United States Steel Corporation.

The United States Steel Corporation on January 28 reported its earnings for the three months ended December 31, 1907, by months. There has been no more striking testimony to the effect of the financial panic on business. The earnings, after deducting all operating expenses, including those for ordinary repairs and maintenance of plants, employees' bonus funds, and also bond interest and other fixed charges of subsidiary companies, were as follows:

October, 1907	\$17,052,211
November, 1907	10,467,253
December, 1907	5,034,531

The earnings for October were the largest for any month in the company's history. As against the total of \$32,500,000 for the quarter, the corresponding figure for 1906 was \$41,700,000. In the quarter ended June 30, 1907, which was the largest on record, earnings were \$45,500,000 and for the September, 1907, quarter \$43,800,000. Unfilled orders on December 31, 1907, were reported as 4,624,553 tons, against 8,489,718 a year previous, 8,043,858 in March, 1907, 7,603,878 in June, 1907, and 6,425,008 in September, 1907.

Traffic Club of New York.

The January meeting of the Traffic Club of New York was held on January 28. James H. Gannon, Jr., Financial Editor of the New York Times, gave a clear review of the causes which brought about the banking panic of October and drew comparisons for the future from the year following the panic of 1893. C. H. Crosby, Vice-President of the United States Express Company, gave a general review of the express business, tracing its history from its beginning in 1839 and describing the various functions of the express companies. The difficulties of compliance on their part with the rules of the Interstate Commerce Commission may be judged from the fact that the filing of the rates to competitive points alone, including points at which there is competition by any possible combination of companies, required 39 volumes, which cost \$45,000. It was announced that Governor Charles E. Hughes will attend the annual dinner, which is to be held on March 6.

Referred to the Committee on Standardization of Practice.

There is a station on the Chicago & North-Western Railroad at State Line, Wis., the depot being built on the boundary line between Wisconsin and Michigan, a white strip down the side of the building showing where one state ends and the other begins.

The station stood mostly on Badger soil and the town has been credited to Wisconsin. Since the passage of the Wisconsin eight-hour law the company has moved the building into Michigan. The postoffice designated as State Line, Wis., is not in Wisconsin, and the agent-operator-baggage-man-express agent-postmaster has to put in more than eight hours service.—Press Despatch.

Final Decision in Axle-Light Suit.

Notice of the decision in the suit of the Consolidated Railway Electric Lighting & Equipment Co., New York, against the Adams & Westlake Co., Chicago, for infringement of its patent relating to car axle generating electric lighting equipment was given in our issue of March 29, 1907, page 462. That decision, which was rendered in the

Circuit Court of the United States for the Northern district of Illinois, Eastern division, held that, with the exception of a single equipment which had been built by the defendant for a customer, the patent had never been infringed. Neither party was fully satisfied with this decision and both appealed, the complainant seeking to have the finding of infringement extended to cover all equipments of the defendant, and the latter asking to be relieved of the finding in the single instance referred to. On January 7, 1908, the United States Circuit Court of Appeals rendered a decision in favor of the defendant and ordered the suit dismissed.

Dinner to Mr. Vreeland.

Responding to numerous suggestions from the membership at large, the executive committee of the New York Railroad Club has arranged a reception and dinner to Herbert H. Vreeland, President of the club, to be given Feb. 7, the hour and place of meeting to be announced later. The announcement says: "Mr. Vreeland has for many years given most generously of his time and effort wherever possible to promote the welfare of the club. In unusual measure he has contributed to its continued success and present high standing. It seems peculiarly fitting that some evidence of our appreciation should be made manifest. Your committee has therefore decided that this testimonial dinner shall be by popular subscription at a cost of \$5 per plate, that each member in attendance may feel he is present as a host and to personally attest his esteem for our president and guest." Members are asked to signify their acceptance by Feb. 1. The circular is signed by W. G. Besler, chairman; Frank Hedley, William B. Albright, Richard L. Thomas, Otis H. Cutler and Daniel M. Brady.

INTERSTATE COMMERCE COMMISSION RULINGS.

Coke Oven Basis of Car Supply Condemned.

The Commission, in an opinion rendered by Chairman Knapp, has announced decision in the case of the Powhatan Coal & Coke Co. v. Norfolk & Western and 56 coal operating companies in the Pocahontas district of West Virginia.

The complaint in this proceeding alleged that the method of car distribution known as the "coke-oven basis," enforced by the Norfolk & Western Railway Company in the Pocahontas-Flat Top coal district, unduly discriminates against the complainant, and asked that the so-called "capacity basis" of car distribution be adopted. The theory of the coke oven basis of distribution is that the available supply of coal cars shall be distributed to mine operators in proportion to the number of coke ovens erected by each operator. That is to say, the number of ovens erected by an individual operation divided by the total number of coke ovens in the district will give the percentage of the available car supply to which such operation is at any time entitled.

The Commission decided that the coke oven basis does not fairly measure the relative rights of the various operators, but unduly discriminates against complainant and operates to the unreasonable preference of other mining companies in the same field.

The Commission further declared that while the mine capacity of a given shipper may be greater than his allotment of cars, yet where this is also the case as to other shippers similarly situated in the same coal field, it is the duty of the carrier, when the supply of cars is inadequate, to fairly distribute the available number among all operators.

It requires only ordinary imagination, said the Commission, to see the illogical and artificial character of the coke oven basis. One company, with limited capital, uses its money in building coke ovens instead of extending its underground workings, while another company expends the same sum in enlarging its mining facilities, but without adding to the number of superfluous ovens. The necessary result would be that the former, with its mining capacity unchanged, would secure an increased car supply, while the latter, with largely augmented ability to produce coal, would have fewer cars for its shipment. A system which involves such absurd consequences is open to grave objection.

It appeared in the case that the Norfolk & Western some years ago became and still is the virtual owner of the coal lands on which the operations in question are located, the legal title thereto being in a land company whose stock is owned by the railroad company. The coke oven basis of car distribution seems to have been the outcome of the general policy of the railroad, in accordance with which the land company required each lessee of coal lands to construct a certain number of coke ovens per hundred acres of land leased. This policy was evidently adopted for the purpose of encouraging coke production and the manufacture in that district of articles which could be made by the use of coke. The railroad company preferred to discontinue the coke oven basis and apparently desired an order of the Commission as a justification for taking that course.

While the Commission is convinced by the facts and circumstances disclosed that the present basis is unjust and results in unlawful discriminations, it is not unmindful that the change which will be directed may occasion loss and injury to some of the operators whose expenditures for the construction of coke ovens, as required by their leases, may be materially, and perhaps greatly, diminished in value. Although not warranted in sanctioning a further continuance of the coke oven basis, which under existing conditions is found to be neither just nor suitable, the Commission does not desire or intend that the report and order herein shall affect the rights, responsibilities or liabilities of any of the interested parties under any contract or agreement which they might otherwise be able to enforce for their benefit. It is assumed that some form of capacity basis suited to the conditions and peculiarities of the district in question will be devised and put into effect; but the railroad should take the responsibility, at least in the first instance, of determining and applying the substituted basis.

The Norfolk & Western was ordered to cease and desist for a period of at least two years from enforcing the coke oven basis in said district. It was further ordered to establish for at least two years a regulation whereby coal cars shall be distributed fairly and equitably among the operators along its line in said district, without undue discrimination against or undue preference in favor of any of said operators.

TRADE CATALOGUES.

Bridges, Buildings and Foundations.—The Condon & Sinks Co., Civil Engineers, Chicago, have prepared a book of views of steel and reinforced concrete structures built after their designs and specifications. These structures include railroad and highway bridges, shops and mercantile buildings, foundations, reservoirs, tanks, roofs, etc. The illustrations, which are half-tone reproductions of photographs, are good and their arrangement is in good taste. Line engravings show two steel truss designs and a reinforced concrete arch. The book is 6 in. x 9 in. and has 31 pages.

Reinforced Concrete Culvert Pipe.—The American Concrete Co., Chicago, a new company, has prepared a pamphlet illustrating and describing its reinforced concrete culvert pipe. The characteristics, construction and advantages of this pipe are described in detail, and its economies compared with cast-iron pipe. The illustrations are full-page half-tones, mostly from photographs. The pipe has been used by the Chicago, Burlington & Quincy for over a year and was described in the *Railroad Gazette* of Oct. 12, 1906. The company also makes reinforced concrete piling and girders.

Testing Alternating Current Generators.—Bulletin No. 1,037 of the Allis-Chalmers Company, Milwaukee, Wis., describes the company's method of testing alternating current generators. It was perfected by B. A. Behrend, Chief Electrical Engineer, who makes it possible to get, comparatively easily, the most important data of the performance of alternating current generators while they are yet in the shop, the machines being subjected to full load conditions without actually putting them under full load.

Valves.—Catalogue No. 10 of the Golden-Anderson Valve Specialty Co., Pittsburgh, Pa., illustrates and describes Anderson cushion non-return valves, emergency stop valves, pressure reducing valves, Clean Seat valves and blow-offs; check valves, balanced plug cocks and blow-offs and Golden steam tilting traps. Other specialties include: Anderson automatic standpipes and counterbalance valves, automatic float valves, controlling altitude valves and strainers and fish traps.

Flexible Conduits and Conductors.—Pamphlet No. 429 of the Sprague Electric Co., New York, describes Greenfield flexible steel conduits and flexible steel armored conductors and cords, together with tools and fittings in connection with them. The conduits are made of rolled concave strips of steel, galvanized inside and out, and rolled spirally on each other so as to interlock. The conductors are armored with sheathing made in a similar way.

Car Couplers and Kindred Devices.—The Washburn Steel Castings & Coupler Co., Minneapolis, Minn., has issued its 1908 catalogue. It illustrates and briefly describes the car couplers and kindred devices made. The latter include a new design of car replacer, shown in this catalogue for the first time. The form and method of working these frogs are fully illustrated. The book is 6 in. x 9 in. and has 94 pages.

Signaling on the Union Pacific.—The passenger department of the Union Pacific has prepared an interesting pamphlet on its interlocking and block signal systems. The principles of both systems are explained briefly, and colored half-tone views illustrate the various indications of the signals. These engravings are made from

photographs and give an excellent idea of the character of Union Pacific signal equipment.

London & North-Western.—The passenger department of this road has published a pamphlet describing in full the "American special" train between Liverpool and London. This service began with the first sailing of the "Lusitania" last fall. The train consists of a baggage car, five corridor cars and a dining car. The pamphlet is illustrated with line drawings of each type of car.

Injectors.—A pamphlet issued by William Sellers & Co., Philadelphia, Pa., describes and illustrates with sectional and prospective views the latest types of Sellers' injectors, giving dimensions, capacities and prices. Other specialties of the company are also included, among them being valves, water strainers and boiler washers.

Bolsters.—Bulletin No. 4 of the Atha Steel Casting Co., Newark, N. J., shows a number of types of cast-steel body and truck bolsters used by various steam roads. Driving wheel centers, motor frames, electric railway truck frames and cast-steel gears made by the company are also shown.

Electric Drive in Cement Plants.—Bulletin No. 4,555 of the General Electric Company, Schenectady, N. Y., describes the application of electric drive to cement plants, and gives information regarding different processes and the apparatus used in making cement.

Springs.—A pamphlet issued by the Union Spring & Manufacturing Co., Pittsburgh, Pa., illustrates and describes a number of types of coil and elliptic springs for locomotives and cars. Several styles of pressed steel journal box lids are also shown.

MANUFACTURING AND BUSINESS.

W. P. Cosper, Chicago, dealer in railroad specialties, has been appointed Central Western Agent for the Lord Electric Co., Boston, Mass.

The Detroit Seamless Steel Tubes Co., Detroit, Mich., is installing machinery to make larger sizes of cold-drawn seamless steel tubes. This increases materially the capacity of the plant.

The St. Paul, Minn., office of the Northern Electrical Manufacturing Co., Madison, Wis., has been moved from 21 East Fifth street to 516 Endicott building. T. E. Drohan, formerly Superintendent of the company's shops at Madison, is in charge of the new office.

A meeting of department and district office managers of the Allis-Chalmers Co. was recently held at headquarters in Milwaukee, Wis. The prevailing note during the meeting was one of decided optimism. With the possible exception of a single district, which depends on one particular product for its prosperity, reports indicate that there is a general resumption of business activity, and the outlook for purchases of material of all kinds, particularly power and electrical machinery, is encouraging. Many district managers stated that during the past two weeks inquiries have been many, and customers are only waiting for a little more nearly complete restoration of normal conditions to place large orders for apparatus.

MEETINGS AND ANNOUNCEMENTS.

For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Engineers' Club of Philadelphia.

At the meeting of this club to be held February 1, there will be a paper on Engineering Problems in Road Construction, by Joseph W. Hunter, illustrated with lantern slides. The Secretary announces the election of the following officers: H. W. Spangler, President; Washington Devereux and William Easby, Jr., Vice-Presidents; Francis Head, Secretary, and George T. Gwilliam, Treasurer.

American Railway Engineering and Maintenance of Way Association.

The nominations for officers for this association to be voted on at the coming convention to be held in Chicago March 17, 18 and 19, are: President, Walter G. Berg (Lehigh Val.); Vice-President, L. C. Fritch (Ill. Cent.); two Directors, C. S. Churchill (Norfolk & West.) and E. F. Wendt (P. & L. E.); Treasurer, W. S. Dawley (Mo. & North Ark.); Secretary, E. H. Fritch, Chicago.

American Society of Mechanical Engineers.

The first meeting of the gas power section of this society is to be held February 11, in the Engineering Societies building at

29 West 39th street, New York. The subjects for discussion will be "Experimental Gas Turbines in France," illustrated with lantern slides; "A Simple Continuous Gas Calorimeter," "A Gas Engine and Producer Guarantee." Other subjects relating to the question of gas power will also be discussed.

Convention Plans for Supply and Machinery Associations.

A joint meeting of the committees appointed from the American Supply and Machinery Manufacturers' Association, the National Supply and Machinery Dealers' Association, and the Southern Supply and Machinery Dealers' Association, was held at Richmond, Va., last Friday to formulate a programme for the joint annual convention of these three associations to be held at the Jefferson Hotel, Richmond, May 13, 14 and 15, 1908. The complete programme will be ready for publication early in April and will be sent to all members of these associations fully a month before the convention.

The committees who met to arrange the programme were made up as follows:

American Supply and Machinery Manufacturers' Association.—M. W. Mix, Dodge Manufacturing Co., Mishawaka, Ind.; E. H. Hargrave, the Cincinnati Tool Co., Cincinnati, Ohio; C. F. Aaron, New York Leather Belting Co., New York; F. A. Hall, the Yale & Towne Manufacturing Co., New York; D. K. Swartwout, the Ohio Blower Co., Cleveland, Ohio; W. M. Hood, the Lunkenheimer Co., Cincinnati, Ohio; F. D. Mitchell, Secretary-Treasurer, New York.

National Supply and Machinery Dealers' Association.—George Puchta, Queen City Supply Co., Cincinnati, Ohio; A. T. Anderson, Secretary-Treasurer, Cleveland, Ohio.

Southern Supply and Machinery Dealers' Association.—J. C. Miller, Miller Supply Co., Huntington, W. Va.; Alvin M. Smith, Smith-Courtney Co., Richmond, Va.; Hunter B. Frischkorn, Hunter B. Frischkorn, Richmond, Va.; Levin Joynes, Southern Railway Supply Co., Richmond, Va.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Pere Marquette.—Henry B. Ledyard, Chairman of the Board of the Michigan Central, has been elected a Director of the Pere Marquette.

Operating Officers.

Baltimore & Ohio.—John G. Walber, hitherto Assistant General Manager of the Baltimore & Ohio Southwestern at Cincinnati, has been appointed Assistant to the Third Vice-President of the Baltimore & Ohio, with office at Baltimore, Md. Mr. Walber began his railroad career on the Ohio & Mississippi in 1885 and has been Secretary to various Managers and Vice-Presidents. He was made Assistant to the General Manager at Cincinnati four years ago.

Canadian Northern.—J. R. Cameron has been appointed General Superintendent, with office at Winnipeg, Man. A. Wilcox has been appointed Superintendent of the First division, with office at Port Arthur, Ont.

Canadian Pacific.—Grant Hall, who has been appointed Superintendent of Motive Power on the Western Lines of the Canadian

Pacific, at Winnipeg, has been Assistant Superintendent of Motive Power for about three years past. Mr. Hall was born in Montreal and was educated at Bishops College School at Lennoxville, P. Q. He entered the service of the Canadian Pacific as a machinist in 1886 and was soon promoted to the position of locomotive foreman. In 1893 he went to the Intercolonial as general locomotive foreman, but in 1898 he returned to the Canadian Pacific and was rapidly promoted through the several grades until he became Assistant Superintendent of Motive



Grant Hall.

Power of the Eastern Lines. In October, 1904, he went to the Western Lines, as before stated.

Chicago & Alton.—Patrick Henry Houlahan, who has been appointed General Superintendent of the Chicago & Alton, with office at Chicago, thus becoming



P. H. Houlahan.

the head of that department on both the Alton and the Toledo, St. Louis & Western, has held that office on the T., St. L. & W. for the past three years. Mr. Houlahan was born in 1855 at Ottawa, Ill., and began his railroad service in 1867 as a water boy with a track construction gang. By 1875 he had become a ticket agent and five years later conductor (on the Fox River branch of the Chicago, Burlington & Quincy). From 1881 to 1886 he was on the St. Louis division of the Burlington, rising from train despatcher to Assistant

Trainmaster and then to the position of Trainmaster. In 1886 he went to the St. Louis, Arkansas & Texas, where he was Master of Transportation on the Missouri & Kansas division, but he soon returned to the Burlington, where he became Superintendent. From 1892 to 1905 he was Superintendent of the Hannibal & St. Joseph, a part of the Burlington System. From there he went to the Toledo, St. Louis & Western, of which road, as before stated, he has been General Superintendent for three years.

Chicago, Burlington & Quincy.—Robert Rice, heretofore Superintendent of the Hannibal division, has been appointed Superintendent of the St. Joseph division, with office at St. Joseph, Mo. E. Welsie succeeds Mr. Rice at Hannibal.

Chicago Great Western.—Charles S. Weston, who has been appointed Division Superintendent of the Southwest division, with office at Des Moines, Iowa, has been for the past five years Superintendent at Red Wing, Minn. Mr. Weston was born in 1858 at Linden, Wis., and began his railroad service on the Burlington, Cedar Rapids & Northern as brakeman in 1879. He was rapidly promoted through the different grades until he became Trainmaster in 1901.

Missouri Pacific.—A. J. Abell has been appointed Superintendent of the Valley division of the St. Louis, Iron Mountain & Southern, with office at Monroe, La., in place of C. H. Bevington, resigned.

Northern Pacific.—George Arthur Goodell, who has been appointed General Superintendent of the Middle district of this road, with headquarters at Livingston, Mont., has for the past five years been General Superintendent of the Chicago Great Western. Mr. Goodell was born at Knoxville, Ill., on August 13, 1855, and began his railroad service on the Chicago, Burlington & Quincy in 1869 as a telegraph operator. He served for a short time on the Toledo, Peoria & Warsaw, and in 1877 went to the Burlington, Cedar Rapids & Northern, where he was promoted successively to the positions of train despatcher, Assistant Superintendent and Superintendent. In 1902 he left that road and went to the Chicago Great Western, as above noted.

Southern.—J. M. Bennett has been appointed Superintendent of the Winston-Salem division, in place of A. M. Smith; office at Winston-Salem, N. C.

Southern Pacific.—The report of the resignation of E. B. Cushing,

General Superintendent at New Orleans, and the appointment of W. M. Hobbs in his place, is denied.

Engineering and Rolling Stock Officers.

Atchison, Topeka & Santa Fe.—A. Dinan, heretofore Master Mechanic of the Middle division, has been appointed Master Mechanic of the Missouri division, with office at Fort Madison, Iowa, in place of J. H. McGoff, promoted. G. W. Taylor, heretofore Master Mechanic of the Oklahoma division, has been appointed Master Mechanic of the Middle division at Newton, Kan., in place of A. Dinan. J. T. Lendrum has been appointed Master Mechanic of the Oklahoma division, with office at Arkansas City, Kan., in place of Mr. Taylor.

Colorado Southern, New Orleans & Pacific.—C. H. Fisk has been appointed Chief Engineer of Maintenance of Way, with office at Beaumont, Tex.

Missouri Pacific.—E. J. Correll has been appointed Division Engineer of the Valley division of the St. Louis, Iron Mountain & Southern at Monroe, La., in place of R. A. Gray, resigned.

Northern Pacific.—C. T. Hessmer has been appointed Master Mechanic of the Minnesota division, with office at Staples, Minn., in place of Williard Lincoln, resigned. Silas Zwright has been appointed Master Mechanic of the St. Paul division, with office at Minneapolis, Minn.

CAR BUILDING.

The Keweenaw Central has ordered 20 flat cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works.

The Pittsburgh, Canonsburg & Washington, under construction, intends to ask bids on electric cars about April 1. F. Uhlenhaut, Pittsburgh, Pa., is Chief Engineer.

The Duluth & Iron Range, it is reported, is in the market for 200 or more freight cars. Up to the time of going to press we have not been able to confirm this item.

The Woodstock, Marengo, Genoa & Sycamore Electric, which is to build 38 miles of road in Illinois, intends to ask bids on rolling stock in April. Charles A. Spenny, Chicago, is Secretary.

The Brownsville, Masontown & Smithfield Street Railway, under construction from Brownsville, Pa., to Uniontown, 36 miles, will ask bids on rolling stock in March. W. J. Sheldon, McKeesport, Pa., is President.

The Morgantown Interstate Railroad, under construction from Morgantown, W. Va., to Star City, four miles, will ask bids on electric cars about April 1. W. W. Smith, Morgantown, W. Va., is Secretary and Treasurer.

The Northern Pacific, as reported in the *Railroad Gazette* of December 6, will, it is said, be in the market for new passenger equipment within a few days. Up to the time of going to press we have been unable to confirm this item.

The Massillon, Wooster & Mansfield Traction, under construction from Massillon, Ohio, to Mansfield, 50 miles, will ask bids on rolling stock in about three months. G. A. Bartholomew, Williamson building, Cleveland, Ohio, is Chief Engineer.

RAILROAD STRUCTURES.

AUSTIN, TEX.—The State Railroad Commission has made public improvement orders which direct that the following work be carried out by the railroads: The Chicago, Rock Island & Pacific to build new stations at Amarillo or to jointly build with the Fort Worth & Denver City a union station at that place; the Texas & Pacific to build new passenger and freight stations at Longview Junction and at Jefferson; the Fort Worth & Denver City to build new stations at Decatur, Electra, Quanah and at Amarillo; the International & Great Northern is required to replace all wooden culverts and bridges with concrete and steel structures.

BROOKLYN, N.Y.—The Delaware, Lackawanna & Western company's freight yard, at Kent avenue and Cross street, is to be enlarged about 17,500 sq. ft., which will permit the handling of 25 more cars. When the yard is enlarged it is understood that the tracks will be rearranged. The improvements will give the yard 175 ft. more frontage on Washington avenue.

ST. LOUIS, MO.—Bids are to be asked for at once by the Manufacturers' Railway Company, controlled by A. Busch and associates, for putting up a steel and reinforced concrete elevated structure at Second and Dorcas streets, St. Louis, at an estimated cost of about \$100,000. The work will call for about 3,000 cubic yards of concrete and 575 tons of steel. Address Edward Flad, Consulting Engineer, Fullerton building.



G. A. Goodell.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BROWNSVILLE, CARMICHAELS & WAYNESBURG (ELECTRIC).—See Brownsville, Masontown & Smithfield.

BROWNSVILLE, MASONTOWN & SMITHFIELD (ELECTRIC).—Grading work is to be started early in February on this proposed electric line from Brownsville, Pa., south via Masontown to New Geneva, thence northeast via Smithfield to Uniontown, 36 miles. Surveys made for 20 miles and being continued on the rest of the line. The company has already graded about half a mile between Masontown and West Masontown. The work will include several viaducts. Contracts are to be let in February and March. E. C. McCullugh, Chief Engineer, Uniontown.

The Brownsville, Carmichaels & Waynesburg has been granted franchises and is shortly to be incorporated to build about 58 miles of electric lines from Waynesburg east to Carmichaels, thence north via Jefferson and Rice's Landing, in Green county, and Clarksville, Zollarsville and Bentleyville, in Washington county; also a line from a point on the Monongahela river opposite Rice's Landing northeast to Brownsville, in Fayette county. Work is expected to be started this spring from Rice's Landing to Waynesburg, 15 miles. When the organization of the company is finished it may be taken over by the Brownsville, Masontown & Smithfield. W. J. Sheldon, McKeesport, holds the franchises and is organizing the company.

CANADIAN PACIFIC.—William Whyte, Second Vice-President, is quoted as saying that in addition to the work already under way, the new work arranged for to be carried out during 1908 includes the completion of the following lines: Between Kirkella and Asquith, Sask., on the Edmonton branch, and a line to Hardisty, Alb.; also a line from Lanigan, Sask., to Sheho, 82 miles; between Woolsey, Sask., and Reston, Man., 23 miles; extension of the Winnipeg Beach line north to Icelandic river; and continuation of the line from Tuxford, Sask., 50 miles west. A large amount of bridge work is also to be carried out; in British Columbia many of the present wooden structures will be replaced by permanent structures.

CENTRALIA EASTERN.—Contract has been given by this company to W. F. Nelson, of Seattle, Wash., for building its proposed line from Centralia, Wash., northeast nine miles. Grading is expected to begin early next month. Contracts will probably soon be let for building five miles additional. B. A. Johnson, Chief Engineer, Centralia.

CHICAGO, LAKE SHORE & SOUTH BEND (ELECTRIC).—This company, building an electric line from South Bend, Ind., west to Chicago, Ill., 71 miles, has track laid on 48 miles. Grading will shortly be finished on 13 miles additional. It is expected to have the entire line in operation by July this year. A mortgage for \$6,000,000 has been filed, of which \$3,500,000 will be used for construction and the remaining \$2,500,000 held for future extensions and improvements.

CUMBERLAND RAILROAD.—Contracts let to S. P. Condon, of Knoxville, Tenn., for extending this road from Artemus, Knox county, Ky., south via Cumberland to Jellico, Tenn., 32½ miles. Track laid from Artemus to Cumberland, 8.2 miles. B. C. Milner, Chief Engineer, Warren, Ky.

EAST CAROLINA.—This road, which was recently extended from Farmville, N. C., south to Hookerton, 13 miles, is now open for freight service on this section, and the company expects to start passenger service next month.

KEWEENAW CENTRAL.—This company is building a branch from Phoenix, Mich., to Eagle River, two miles.

MEXICO, SANTA FE & PERRY TRACTION.—An officer writes that this company began grading its proposed line from Mexico, Mo., northeast via Molino and Santa Fe to Perry, 27 miles, last November. J. M. Wolfe, Collinsville, Ill., has contracts for all the work, some of which has been sublet. About three miles of grading is finished and the company expects to have the entire line in operation about September of this year. The work includes a number of bridges for which contracts are soon to be let. An extension from Mexico to Columbia is also projected. S. L. Robison, President and General Manager, and C. O. Thon, Chief Engineer, Belleville, Ill.

MORGANTOWN & DUNKARD VALLEY (ELECTRIC).—Under the name of the Morgantown Interstate Railroad grading is now under way for an electric line from Morgantown, W. Va., to Star City, four miles. The work includes a bridge 600 ft. long. W. W. Smith, Secretary and Treasurer, Morgantown.

MORGANTOWN INTERSTATE (ELECTRIC).—See Morgantown & Dunkard Valley.

MOUNTAIN CENTRAL.—An officer writes that the projected extension from Campton, Ky., northeast to Hazel Green, has been abandoned for the present.

PITTSBURGH, BINGHAMTON & EASTERN.—Building from Bingham-

ton, N. Y., southwest to Clearfield, Pa., 232.5 miles. Grading under way from Renova, Pa., to above Westport. Contract let to the Holbrook, Cabot & Rollins Corporation, Boston, Mass. About 21 miles was built from Cedar Ledge, Pa., to Powell last year. Additional contracts will probably soon be let.

Branch located and most of the rights of way have been secured from Cedar Ledge to Oregon Hill, 32 miles. Work will probably be started this spring.

RED BUD & BELLEVILLE INTERURBAN.—Incorporated in Illinois to build an interurban line from Red Bud, Randolph county, Ill., north through Monroe county to Smithton, 15 miles. C. Becker, Red Bud; J. Keller, Hecker, Ill., and B. A. Gundlach, Belleville, incorporators.

ST. LOUIS & OKLAHOMA SOUTHERN.—This company has been incorporated with a capital of \$10,000,000 to build a line from Benton County, Ark., southwest to a point near Oberlin, Bryan county, Okla., 260 miles. H. G. Baker and W. R. Eaton, of Muskogee; C. L. Stower, J. B. Christensen and J. H. Elton, of St. Louis, incorporators.

SOUTHERN PACIFIC.—The Cananea, Yaqui River & Pacific, building through western Mexico, it is expected, will be nearing completion by the close of 1908. The government concession requires that 248 miles of track shall be built this year, but the company plans to greatly exceed this mileage. Orders have been given for 30,000 tons of 65-lb. rails for delivery at Guaymas during 1908. Large quantities of construction materials are also arriving at Orendain, where the road will connect with the Mexican Central. The federal inspector of railroads reports that the following track has been finished: Main line from Guaymas southeast, 217.5 miles; from Mazatlan north toward Guliacan, 17.5 miles; Mazatlan south toward Tepic, 22.5 miles; Orendain toward Tepic, 7.5 miles; Nacozari branch, 18 miles; branch between Cananea and Nogales, 12.5 miles; branch between Alamos and Navajo, 47 miles; and on the branch between Corral and Cumaripa, 37 miles.

SUSQUEHANNA & NEW YORK.—This company, in 1907, finished an extension of its road from Pleasant Stream to Marsh Hill, Pa., from which point trackage arrangements have been made with the Pennsylvania into Williamsport. At Williamsport the company has shops and yards, and connection is made with the Philadelphia & Erie division of the Pennsylvania, with the Pennsylvania division of the New York Central and with the Philadelphia & Reading, giving a good connection from the coal fields of Pennsylvania to New England points. In addition the company has carried out revision work on its main lines from Tonawanda to Ralston, replacing light rails with 80-lb. sections and putting in heavy bridges to replace light structures.

WOODSTOCK, MARENGO, GENOA & SYCAMORE (ELECTRIC).—This company, which was incorporated last year to build an electric line from Woodstock, Ill., southwest via Marengo and Genoa to Sycamore, 38 miles, is ready to receive bids for material and for building the line. The company expects to begin grading work in May. Charles A. Spenny, Secretary, Chicago, Ill.

RAILROAD CORPORATION NEWS.

BALTIMORE & OHIO.—A semi-annual dividend of 2½ per cent. has been declared on the \$8,000,000 common stock of the Cleveland, Lorain & Wheeling, which is operated by the Baltimore & Ohio. The Baltimore & Ohio owns about 75 per cent. of its stock. This is the first dividend on the common.

BOSTON & MAINE.—This company has renewed for one year at 6 per cent. \$1,000,000 5 per cent. one-year notes maturing on Feb. 15 and \$1,000,000 5 per cent. one-year notes maturing on March 15. It has also arranged to sell \$1,300,000 Boston & Lowell one-year 6 per cent. notes. This arrangement was in addition to the renewal of \$1,000,000 5 per cent. one-year notes which fell due on Jan. 15, and \$500,000 Fitchburg Railroad one-year notes which fell due on the same date, both of which were renewed for one year at 6 per cent. All these arrangements were made through R. L. Day & Co., of Boston, and associates.

BOSTON & WORCESTER STREET.—E. H. Gay & Co., New York, have offered \$250,000 4½ per cent. first mortgage bonds of 1923 of this company at 96. The Boston & Worcester has paid 6 per cent. dividends on its stock since completion of the road in 1904.

CHICAGO, MILWAUKEE & ST. PAUL.—On January 1 train service was extended so that the Pacific extension is now in operation from Mobridge, S. Dak., on the Missouri river west to Marmarth, N. Dak., 193 miles. At the same time the train service in Montana was extended. The road is now in operation in that state from Harlowton Junction east to Musselshell, 92 miles. It is expected that the road will be in operation from the Missouri river to Butte in May or June. Rails are being laid on the completed grading at the rate of about four miles a day.

CHICAGO, ROCK ISLAND & PACIFIC.—For the five months ended Nov. 30, 1907, gross earnings were \$27,200,000, against \$24,700,000 in 1906. Including in the operating expenses for 1907, \$498,000 on account of depreciation of equipment, net earnings were \$7,900,000, against less than \$8,950,000 in 1906. As no similar depreciation charge was made in 1906, the net earnings for 1907 on a straight comparison would be \$8,400,000 instead of \$8,950,000. The other increase of \$556,000 over the 1906 operating expenses was largely due to increased wages and higher cost of materials and labor.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—A semi-annual dividend of 1 per cent. was on January 28 declared on the \$47,000,000 common stock. Four per cent. has been paid annually since 1901, in which year 3½ per cent. was paid. In 1900 3 per cent. was paid. This was the first distribution since 1893, when also 3 per cent. was paid.

Income results (partly estimated) for the 12 months ended December 31, 1907, were as follows:

		Increase.
Earnings	\$26,384,300.00	\$1,789,400.00
Expenses (76.11 per cent.)	20,081,300.00	1,648,000.00
Net earnings	6,303,000.00	140,800.00
Other income	180,900.00	27,700.00*
Gross income	6,483,900.00	113,100.00
First charges and taxes	4,520,900.00	214,800.00
Available for dividend	1,963,000.00	101,700.00*
Dividends†	1,911,500.00	100,200.00*
Surplus	51,500.00	1,500.00*

*Decrease.

†5 per cent. on preferred, and 3 per cent. on common, in 1907; 5 per cent. on preferred, and 4 per cent. on common, in 1906.

CLEVELAND, LORAIN & WHEELING.—See Baltimore & Ohio.

CONNECTICUT RAILWAY & LIGHTING.—See New York, New Haven & Hartford.

DELAWARE & HUDSON.—This company has borrowed \$6,000,000 for six months at 4½ per cent. from the First National Bank and Kuhn, Loeb & Co., of New York City. The proceeds will be used to pay off \$6,000,000 one-year notes of the Quebec, Montreal & Southern, which mature early in February.

FLORIDA EAST COAST.—Harvey Fisk & Sons, New York, have offered at 98 to yield about 7 per cent. \$750,000 3-year 6 per cent. notes due Aug. 15, 1910. These are part of a total issue of \$5,080,000 which were issued in two series, \$3,500,000 dated Aug. 1, and \$1,580,000 dated Aug. 15, 1907. These notes are secured by \$7,258,000 first mortgage 5 per cent. bonds of the Florida East Coast, which is at the rate of 70 per cent. of the par value of the bonds. The notes are further secured by the personal endorsement of Henry M. Flagler, of the Standard Oil Company. The first mortgage bonds which are deposited as collateral are all the first mortgage bonds outstanding, and are a first lien at the rate of \$18,000 a mile on the main line from Jacksonville to Miami, 366 miles, 37 miles of branches and all the rolling stock and other property of the company. The proceeds of these notes were used in the extension which is being built south along the Florida Keys to Key West, which was recently opened as far as Knight's Key, 47 miles from Key West.

HUDSON & MANHATTAN.—The Hudson Companies, through Harvey Fisk & Sons, New York, are offering to preferred stockholders at 98½, \$50,000,000 6 per cent. 2-year collateral notes secured by \$22,500,000 4½ per cent. convertible bonds of the Hudson & Manhattan Railroad. This company's line is soon to be in operation from the Susquehanna station to Hoboken to Sixth avenue and 14th street, New York.

ILLINOIS CENTRAL.—New financing is being considered. On June 30, 1907, bills payable outstanding amounted to \$10,300,000 against \$1,400,000 a year earlier. These represented principally construction expenditures on the lines to Indianapolis and Birmingham.

MISSOURI PACIFIC.—This company has \$6,000,000 two-year 5 per cent. notes outstanding which mature on February 10. In order to refund them it has sold \$6,000,000 two-year collateral 6 per cent. convertible gold notes dated February 10, 1908, which are secured by \$12,000,000 Kansas & Colorado Pacific first refunding mortgage 30-year 6 per cent. bonds dated February 1, 1908, guaranteed by the Missouri Pacific. These notes have been offered by Taiter & Company of New York at 99, yielding 6 per cent. income. The Kansas & Colorado Pacific owns 1,450 miles of the Missouri Pacific lines, including the Colorado through line. This new mortgage is subject to prior liens, at the rate of \$15,544 per mile. The authorized issue of the new bonds, including refunding of the prior liens, is limited to \$30,000 a mile, or \$43,500,000. These notes, being secured by bonds, are believed to be a legal investment for insurance companies in the state of New York. They are the first convertible notes ever issued by any company.

The Attorney-General of New York has rendered an opinion that in order to have their bonds qualify as legal investments railroad companies must pay dividends in cash. The bonds of the Missouri Pacific, heretofore legal savings bank investments, will therefore cease to be such on expiration of a year within which the company has not paid cash dividends equal to at least 4 per cent. on stock. The January dividend of 2½ per cent. was paid in stock. If, however, the Missouri Pacific should before the end of 1908 declare a total dividend of 4 per cent. in cash the bonds of the company would still remain legal savings bank investments.

NATIONAL RAILWAYS OF MEXICO.—It is probable that the financial plan for the merger of the Mexican Central, the National of Mexico, the Mexican International and the Interceanic will be announced shortly. Its general terms were announced in 1907, but it was postponed because of the financial situation.

NEW YORK CENTRAL & HUDSON RIVER.—The option given by the New York, New Haven & Hartford to the New York Central to buy a controlling interest in the \$29,160,000 New York, Ontario & Western stock held by the New Haven at the price paid for it by the New Haven, \$45 a share, has been again extended; this time indefinitely. The original option expired on April 1, 1907, and the second on January 1, 1908.

NEW YORK, CHICAGO & ST. LOUIS.—An annual dividend of 5 per cent. was on January 28 declared on the \$11,000,000 second preferred stock. In 1907, 4 per cent. was paid, from 1902 to 1906 inclusive, 3 per cent., and in 1901, 2 per cent., the first payment on this issue.

NEW YORK CITY RAILWAY.—The receivers of this company have brought suit in the United States Circuit Court at New York against the Metropolitan Securities Company and its directors, alleging that these directors, most of whom were also directors of the New York City Railway, entered into a conspiracy whereby the notes of the New York City Railway were sold to the Securities company at a discount of 30 per cent. It is claimed that the Securities company derived a profit of \$2,797,200. The New York City Railway asks for an accounting. The Metropolitan Securities Company is the owner of all the stock of the New York City Railway.

NEW YORK, NEW HAVEN & HARTFORD.—At a recent meeting of the stockholders of the Connecticut Railway & Lighting Company the Chairman said that the company is earning about 4 per cent. on its \$8,100,000 4 per cent. cumulative preferred stock and 2 per cent. on its \$9,000,000 common stock. The road is leased to the New York, New Haven & Hartford. It has 193 miles of track in trolley lines.

The \$39,029,600 convertible 6 per cent. debentures offered in December at par to holders of stock and debenture bonds have been fully subscribed. Between \$20,000,000 and \$25,000,000 has already been paid in.

NEW YORK, ONTARIO & WESTERN.—See New York Central & Hudson River.

NEW YORK-PHILADELPHIA COMPANY (ELECTRIC).—This company operates trolley cars between Philadelphia and Jersey City. It owns about two-thirds of the stock of the Camden & Trenton Railway and all the stock of the Trenton & New Brunswick. These companies are now in default in interest payments on their bonded debts.

PITTSBURGH & LAKE ERIE.—Gross earnings for the year ended Dec. 31, 1907, were \$14,900,000, against \$14,500,000 in 1906, and net earnings \$3,384,000, against \$3,288,000 in 1906. Of the gross earnings, \$13,300,000 were from freight, against \$13,000,000 in 1906, and \$1,400,000 from passenger, against \$1,300,000 in 1906.

QUEBEC, MONTREAL & SOUTHERN.—See Delaware & Hudson.

ST. LOUIS & SAN FRANCISCO.—Kleybolte & Co., of New York, have offered at prices yielding 6¼ per cent., \$669,000 6 per cent. equivalent trust certificates maturing semi-annually from 1908 to 1918, inclusive. These cover 45 locomotives bought from the Baldwin Works for \$743,690.

UNION PACIFIC.—The Attorney-General of the United States has directed that a bill in equity be filed in the United States Circuit Court at Salt Lake City, Utah, to set aside the control by the Union Pacific of the Southern Pacific and the San Pedro, Los Angeles & Salt Lake, and to have declared illegal its ownership of stock in the Atchison, Topeka & Santa Fe, the Great Northern and the Northern Pacific, on the ground that all these lines are its competitors. F. B. Kellogg and C. A. Severance, of St. Paul, who were the counsel for the Interstate Commerce Commission in the Harriman investigation of 1907, have been engaged as special assistants to the Government. See editorial columns.